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Catlow Twine Basketry through Time and Space: Exploring Shifting Cultural Boundaries through Prehistoric and Ethnographic Basketry Technology in the Northwestern Great Basin

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Abstract

In this dissertation, I focus on Catlow Twine basketry and address several questions about connections between prehistoric and ethnographic groups in the Great Basin and how and when prehistoric populations moved across the landscape. My results suggest that: (1) diagnostic basketry types in the northwestern Great Basin can be used to track different ethnolinguistic groups through time and space; (2) continuity in technological attributes of Catlow Twine basketry suggests an early and widespread occupation of Penutian speaking groups in the northwestern Great Basin; and (3) the technological relationship between Catlow Twine and ethnographic Klamath-Modoc basketry reflects continuity in basket making traditions that was severely disrupted by contact with Euro-American settlers and the sale of Native American basketry during the Arts and Crafts Period (1880-1920).

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Chapter 1:

INTRODUCTION

Basketmaking is one of the oldest non-lithic crafts (Adovasio 1977). Basketry encompasses a wide range of woven objects including mats, sandals, and a variety of containers such as bags, bowls, trays, jars, burden baskets, fish traps/weirs, cradles, and hats, all manufactured using one of the three basic weaving techniques (*plaiting*, *twining* and *coiling*). Because baskets are woven, they are considered *textiles* (Adovasio 2016), but are made without the use of a frame or a loom, although current research (Connolly et al. 2016; Fowler et al. 2000) suggests that some of the earliest woven objects found in North America were likely made using such devices. This possibility has led researchers (Connolly et al. 2016; Fowler and Hattori 2011, 2012) to reevaluate their understanding of the technical skills of ancient weavers.

In early descriptions (e.g., Holmes 1884; Mason 1885, 1894, 1900, 1904), prehistoric basketry was compared to ethnographic basketry. During the ethnographic period (post-1850), researchers recorded as much information about the lifeways of indigenous people as possible. Mason's work in the early 1900's was the first "meaningful attempt" (Adovasio 1974:100) to develop a taxonomic style of basketry analysis, but it was broad in focus and fixated mostly on ethnographic basketry. Mason's work was followed by Pepper (1902), whose article *The Ancient Basketmakers of Southeastern Utah* reported significant basketry collections from San Juan County, Utah. Loud and Harrington (1929) analyzed basketry from Lovelock Cave, Nevada using, broad terminology but also applying taxonomic descriptions and categories. A year later, Weltfish's (1930) ethnographic work *Prehistoric Native American Basketry Techniques and Modern Distributions* was published. Her descriptions (Weltfish 1930, 1932) were influenced by publications from the American Southwest because few Great Basin sites besides Lovelock Cave were known to contain basketry at that time. Nonetheless, Weltfish (1930) provided information about basketry types found in archaeological contexts including Lovelock Cave and compared them to basketry types from the ethnographic Southwest.

A decade later, Morris and Burgh (1941) published *Anasazi Basketry: Basket Maker II through Pueblo III*, which contained a thorough and detailed analysis and classification of Anasazi materials. This publication differed from earlier reports because the authors recognized certain intricacies (e.g., splices, starts, and finishes) of prehistoric basketry now thought to be "highly standardized and culturally determined" (Adovasio 1974:101). Cressman's (1942) excavations at several northern Great Basin sites between 1938 and 1941 provided preliminary information about basketry in that region. Like Weltfish (1930), Cressman's (1942) collaborative monograph *Archaeological Research in the Northern Great Basin* was the first publication to highlight and compare distinctive attributes of northern Great Basin basketry types. This publication remains one of the best technical reports detailing twined technology because it focuses on comparing ethnographic and archaeological basketry.

Emery's (1966) *The Primary Structures of Fabric* was aimed at standardizing terminology for describing both fabric and basketry, and how terms were used and misused in the literature. *Basketry* and *cloth* have been used as generic terms for large groups of fabrics. Traditionally, basketry has been a general term applied to the products of basket making and the process and techniques used to manufacture them (Mason 1904). The word cloth refers to products of cloth making (Emery 1966), which differ from basketry because of the cloth fineness and its intended use (e.g., for wearing, draping, or covering objects). Weaving in cloth-making is like basketry because it refers to both the process and the product. This can be confusing because there are two kinds of basketry, woven and sewn, and the distinction is between woven basketry and woven cloth. Terminology for the manufacturing of cloth is often used to describe basket making techniques, while terminology used for basketry is not usually borrowed for describing fabrics (Emery 1966).

Adovasio's (1970) *The Origin, Development and Distribution of Western Archaic Textiles* contained the first detailed description of prehistoric basketry in North America. His analysis of 500+ pieces of Great Basin basketry is still used as the basis of understanding cultural boundaries and population movement in the Great Basin. From this research, he developed a universal terminology for several common types, and his subsequent work *Prehistoric North American Basketry* (Adovasio 1974) focused primarily on analysis and preservation techniques. It also reinforced the taxonomic categorization of basketry so that specimens could be accurately and consistently compared. For example, basketry can be divided into three sub-classes of weaving that are "mutually exclusive and taxonomically distinct" (Adovasio 1977:1): (1) plaiting; (2) twining; and (3) coiling. These three subclasses have significant variation; therefore, they must be described based on each attribute. This type of analysis was further developed in a subsequent publication, *Basketry Technology: A Guide to Identification and Analysis* (Adovasio 1977).

Technological Types of Basketry

Researchers use numerous terms to describe basketry. *Twining* involves turning groups of two or more elements of the same set “about each other” to enclose successive elements of the opposite set (Emery 1966:206) (Figure 1.1). *Pairing* is used in twining to refer to two wefts that are manipulated together. *Cording* is associated mostly with the warp and involves twisting two or more elements about each other. *Compact* or *spaced* are terms used when referring to twining. Compact twining is also called *close* twining, while the terms *twined openwork* or *openworked twining* are not used synonymously with *spaced twining*. Spaced twining refers to the setting of distance between successive rows or courses of twining elements. Twining is also a subclass of basket weaves where the moving or active horizontal elements (wefts) move around the stationary or passive elements (warps) (Adovasio 1977).

Plaiting has been used synonymously with braiding and weaving, but there are differences between the three terms and what they denote (Emery 1966). Plaiting describes any interworking of elements accomplished without using mechanical aids. Plaiting is distinguished from other types of *interworking* because it is constructed using a single set of undifferentiated elements and is the basketry equivalent of weaving. The term plaiting, is not exclusive because some objects are labeled “plaited” without processing the defining characteristics (Emery 1966:68). Plaiting is also a sub-class of basket weaves where the elements are all active (Adovasio 1977). Both single elements (strips) pass over and under each other at 90° and have no other engagement. Connolly (1994) describes plaiting as a subtype of *Interlace Weaving*, which includes both plaiting and *Wickerware* and, like Adovasio (1977), he describes it as the simplest basket making technique.

Wickerware, a type of plaiting, varies because the elements interlace in the same way but are rigid instead of flexible (Figure 1.2). It can be further described using intervals where one set of elements crosses over the other. These are assigned numerical values (e.g., 3/3 is three over three). *Simple Plaiting* (Figure 1.3) refers to a variety of plaiting where the weaving elements pass over each other in single intervals (1/1) but can consist of one element or several elements that are considered one unit. In *Twill Plaiting* (i.e., twilling, chevron weave, herringbone weave, diagonal plaiting, or twilled twos), two or more elements pass over the others at staggered intervals (e.g., 2/2, 3/3, or 4/4) and each element must encompass two or more elements (Adovasio 1977).

Coiling describes a spiral or conical development of fabric, but also the coil-like shaping of each stitch (Emery 1966). The problem with using this term without further distinction is that there are certain expressions, such as coiled netting, lace coiling, and needle coiling, where it is not specified whether coiling refers to the shape of the fabric, the type of the stitch, or both (Emery 1966). Coiling or *coiled* can be used to describe basketry and pottery where there is a building up and shaping of material (Emery 1966). Using coiled to describe a type of basketry requires a separate description of the type of stitches or the sewing together of the foundation. Coiling is also a basketry sub-class where weaves are manufactured by sewing a stationary horizontal element or set of elements (the foundation) with moving vertical elements or stitches (Adovasio 1977). Adovasio (1970) also considers the main structural unit of the basket to be the coil. Analysts typically look at the spacing of the foundation (close coiling, open coiling), kind, number, and arrangement of foundation elements (rod, bundle, welt, single element foundation, horizontal foundation, stacked foundation, and bunched foundation), and the type of stitch (simple stitch, intricate stitch, and wrapping stitch) (Figure 1.4).

Current Research in Basketry Analysis

Current basketry research focuses on textile technology and chronology of basketry. Some researchers increasingly seek an understanding of how stylistic and technological attributes to inform us about broader issues related to social dynamics such as shifting cultural boundaries and population movements, economic patterns (i.e., trade and exchange), and social identity (i.e., gender and ethnicity) (Drooker 2001). Additionally, researchers seek an understanding on how nonperishable items (e.g., impressions on ceramic vessels or bone needles and awls) might inform us about prehistoric textiles and basketry. Ethnographic analogy is also useful for interpreting prehistoric textiles and basketry, and while it can be difficult to find a direct link between prehistoric and ethnographic people, combining this type of analysis with more technologically based research has proven useful (Minar 1999, 2000; Petersen et al. 2001).

Basketry is one of the oldest non-lithic crafts, but cordage and netting likely preceded basketry containers (Adovasio 2016; Connolly et al. 2016). Recent collaborative research (e.g., Adovasio et al. 1996, 2001, 2005; Soffer and Adovasio 2004; Soffer et al. 1998) has provides evidence for cordage and netting in the form of negative impressions on fired clay that existed in Europe as early as 28,000 cal B.P. These impressions were initially identified at Dolní Věstonice I and II and Pavlov I in Moravia, Czech Republic (Adovasio et al. 1996, 2001, 2005). These sites were likely occupied by people from the Pavlov Culture, which was an early local form of the Gravettian technocomplex dating to 28,000-23,000 cal B.P. Later sites in Russia such as Kostenki I-II and Zaraisk (see Soffer et al. 2000) contained additional fired clay objects with impressions of cordage-based technologies, dating to 21,000-19,000 cal B.P. Cordage impressions have also been found on the flattened side of a worked basal antler fragment from Gönnersdorf in Germany, dated to 15,000 cal B.P. (Soffer et al. 2000), and charred cordage has been recovered from the sites of Mezhirich in the Ukraine and Kosoutsy in Moldova (Adovasio 2016). According to Adovasio (2016), clay impressions of six-ply rope-gauged cord were also recovered from one of the galleries at Lascaux Cave (also see Glory 1959; Leroi-Gourhan 1982). In the Sea of Galilee, Israel, S-spun cordage with a Z-twist was recovered and dated to 19,300 cal B.P. (Nadel et al. 1994) and recently cordage dated to 30,000 cal B.P. was recovered from Dzudzuana Cave, Georgia (Kvavadze et al. 2009). There is also documentation of two types of twining (close simple twining, Z-twist weft and open simple twining, with a Z-twist weft) and cordage from the Primorye region of Russia dated to 13,500 cal B.P. (Derevianko and Medvedev 1995; Hyland et al. 2002; Zhushchikhovskaya 1996, 1997). According to Adovasio (2016:4), this latter region sits "on the doorstep of the Bering platform, the doorway to the New World". It is likely that plant and fiber products were an important part of the toolkit of the first groups to colonize the Americas (Adovasio 2016).

Current research in the Great Basin (see Connolly et al. 2016 for a recent review) provides further evidence that textile manufacturing was complex and well-developed early in North American prehistory. Paisley Caves, Oregon has the oldest dated cordage in North America, with more than ten pieces dating to between ~12,700 to 10,200 cal B.P. (Connolly et al. 2016). According to Connolly et al. (2016) cordage was used for net and basket making, but also used in snares, and as fishing line. Fine woven objects likely made using either a ground loom or a frame date to ~10,900 cal B.P. These objects, which consist of mats and mat-based bags, are currently the oldest dated textiles in North America. Fort Rock sandals and pieces of cordage, which are almost all made using the same cord-making technology (Z/ss), date slightly later. Z/ss cordage was also used to manufacture Catlow Twine basketry, which dates to ~9,400 cal B.P. in the western Great Basin (Connolly et al. 2016; Fowler and Hattori 2011, 2012).

Catlow Twine is the focus of this dissertation. Catlow Twine is a semi-flexible twined basketry manufactured by weavers using a Z-twist weft direction and an S-spun Z-twist cordage warp. It is manufactured mostly from tule (*Schoenoplectus acutus*) and sometimes cattail (*Typha latifolia*). Catlow Twine is found in parts of the western Great Basin (e.g., the Humboldt Basin, Pyramid Lake, and the Winnemucca Lake Basin) and dates from ~9,400 to ~1,000 cal B.P. In the northern Great Basin (e.g., the Fort Rock Basin, Catlow Valley, Warner Valley, and Summer Lake), it dates from ~7,600 to ~150 cal B.P. and may have technological connections to ethnographic Klamath and Modoc basketry. Some of the major questions regarding Catlow Twine basketry are: (1) does

Catlow Twine basketry have technological continuity through time and space for over 9,000 years (2) are there technological connections between Catlow Twine basketry and ethnographic Klamath and Modoc basketry and (3) what can this information tell us about the makers of this technology and their ethnolinguistic affiliation?

In the following chapters, I explore basketry technologies as markers of shifting cultural boundaries in the Great Basin using methods such as taxonomic basketry analysis, frequencies of basketry types through time and space, and AMS radiocarbon dating. In Chapter 2, AMS radiocarbon dates and basketry counts from archaeological sites provide the frequencies of diagnostic basketry types through time and space in the northern and western Great Basin; these types include warp-faced plain weave (a type of plaited) basketry, Catlow Twine basketry, Lovelock Wickerware, and twined Numic basketry. These are diagnostic types due to their combinations of unique taxonomic components and each has been interpreted by researchers as marking distinct Great Basin populations. For example, warp-faced plain weave (plaited) technology occurs early (~11,000-9,700 cal B.P.) in the northwestern Great Basin but it is uncommon, perhaps reflecting the highly mobile lifestyle and the population size of the hunter-gatherers that occupied this region during the terminal Pleistocene/early Holocene (TP/EH) (~14,700-9,300 cal B.P.). Catlow Twine basketry, which first appears at the end of the TP/EH (~9,400 cal B.P.) in low frequencies in the western Great Basin, became the dominant basketry type in the northern Great Basin beginning ~7,900 cal B.P. The same type of basketry (close simple twined with a Z-twist weft and cordage warp) was made many millennia later by ethnographic Klamath and Modoc weavers who occupied parts of northeastern California and southeastern Oregon. The timing and movement of Catlow

Twine basketry suggests that ancestral Penutian populations – the likely ancestors of today's Klamath and Modoc groups – may have once occupied the Great Basin as far south as Pyramid Lake and Winnemucca Lake. This migration is further supported by linguistic, ethnohistoric, genetic, and archaeological data (e.g., projectile points, shell beads and ornaments, and semi-subterranean pithouses structures) (Delacorte 2008; Hattori 1982). Lovelock Wickerware basketry has been found solely in the western Great Basin, specifically in the Humboldt Sink and surrounding Pyramid Lake and Winnemucca Lake. This basketry type dates to between ~3,500 and ~600 cal B.P. and likely developed *in situ*. Its disappearance correlates strongly with the hypothesized expansion of Numic-speaking groups into the western Great Basin. Twined basketry often associated with ethnographic Numic-speaking groups has been identified by researchers (e.g., Loud and Harrington 1929; Tuohy and Hattori 1996) in low numbers at Lovelock Cave, Humboldt Cave, Dirty Shame Rockshelter, and some sites in the Winnemucca Lake and Pyramid Lake areas. Dates for twined Numic basketry range from ~400 to 150 cal B.P. and suggest that Numic groups entered this area later than has been previously suggested (see Lamb 1958).

In Chapter 3, I examine the frequency of Catlow Twine through time by comparing gaps in the radiocarbon date sequences of Catlow Twine specimens from the northern and western Great Basin. I use previous and new dates on Catlow Twine to determine whether the observed gaps are due to a sampling error or other factors (e.g., site abandonment, population movements, technological change). Based on the current sample of radiocarbon dates, three significant gaps appear in the Catlow Twine record. The earliest is a 1,168-year gap that falls between 9,088 and 7,920 cal B.P. This gap suggests that Catlow Twine may have emerged earlier in the western Great Basin than the northern Great Basin. The second significant gap is between ~7,018 and 5,831 cal B.P. and corresponds with hiatuses seen at caves and rockshelters in the northern and western Great Basin. The most recent gap is between ~3,986 and 2,249 cal B.P. and corresponds with additional hiatuses in rockshelter and cave occupations. Chapter 3 also compares attribute data between specimens. These attributes include: (1) features of wall construction (weft direction, construction of warp unit [warp spin and twist], and warp and weft insertion [warp and weft splicing]); (2) starting technique; (3) rim finish; (4) decoration type; (5) decoration design; and (6) vessel type. My results indicate that Catlow Twine production techniques stayed consistent through time in the northern and western Great Basin.

In Chapter 4, I compare the attributes of Catlow Twine basketry from archaeological sites in the northern and western Great Basin to ethnographic Klamath and Modoc basketry from three museum collections (at the Phoebe Hurst Museum of Anthropology, the University of Oregon's Natural and Cultural History Museum, and the Nevada State Museum) to test the hypothesis that there is substantial technological continuity between archaeological and ethnographic basketry. My results indicate that while Catlow Twine and ethnographic Klamath and Modoc basketry display many similarities, there are some major stylistic differences that may be related to the cultural disruption that happened during the ethnographic period. Another possible explanation for the differences is an increase in Native Americans who manufactured basketry for sale during the Arts and Crafts Period (1880-1920). Because Klamath, Modoc, and Northern Paiute people occupied the Klamath reservation during the ethnographic period, weavers from these tribes could have been manufacturing and selling Klamath-style basketry as part of a market economy.

My research supports the idea that basketry is a useful artifact type for marking prehistoric shifts in cultural boundaries. Catlow Twine basketry is unique in the region due to its longevity and technological consistency. The movement of Catlow Twine basketry through time in the Great Basin provides evidence that the middle Holocene occupants in the northwestern Great Basin were possibly ancestral Penutian groups who were later replaced by Numic-speaking populations. While significant questions remain, my work provides a better understanding of prehistoric populations in the region and how they moved across the landscape. It also provides a possible link between prehistoric and ethnographic populations in this area.

References Cited

Adovasio, James M.

1970 The Origin, Development, and Distribution of Western Archaic Textiles. *Tebiwa* 13(2):1-40.

1974 Prehistoric North American Basketry. In *Collected Papers on Aboriginal Basketry*, edited by Donald R. Tuohy and Doris L. Rendall, pp. 194-205. Nevada State Museum Anthropological Papers No. 16, Carson City.

1977 *Basketry Technology: A Guide to Identification and Analysis*. Aldine Publishing Company, Chicago.

2016 *Decorated Basketry from the Great Basin and Peru*. Paper Presented at the 35th Biennial Great Basin Anthropological Conference, Reno, Nevada.

Adovasio, James M., Olga Soffer, and Bohuslav Klíma

1996 Upper Paleolithic Fiber Technology: Interlaced Woven Finds from Pavlov I, Czech Republic, c. 26,000 Years Ago. *Antiquity* 70(269):526-534.

Adovasio, James M., David C. Hyland, and Olga Soffer

2005 Textiles and Cordage. In *Pavlov I Southeast: A Window into the Gravettian Lifestyles*, edited by Jiří Svoboda, pp. 432-444. Academy of Science of the Czech Republic, Institute of Archaeology, Brno.

Adovasio, James M., David C. Hyland, Olga Soffer, and Bohuslav Klíma

2001 Perishable Industries and the Colonization of the East European Plain. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 285-313. Occasional Paper No. 28. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Connolly, Thomas J.

1994 Prehistoric Basketry from the Fort Rock Basin and Vicinity. In *Archaeological Researches in the Northern Great Basin: Fort Rock Archaeology since Cressman*, edited by C. Melvin Aikens and Dennis L. Jenkins, pp. 63-83. University of Oregon Anthropological Papers No. 50, Eugene.

Connolly, Thomas J., Pat Barker, Catherine S. Fowler, Eugene M. Hattori, Dennis Jenkins, and William J. Cannon

2016 Getting Beyond the Point: Textiles of the Terminal Pleistocene/Early Holocene in the Northwestern Great Basin. *American Antiquity* 81(3):490-514.

Cressman, Luther S.

1942 *Archaeological Research in the Northern Great Basin.* Carnegie Institute of Washington Publication No. 538. Washington, D.C.

Delacorte, Michael G.

2008 Desert Side-Notched Points as a Numic Population Marker in the Great Basin. In *Avocados to Millingstones: Papers in Honor of D.L. True,* edited by Georgie Waugh and Mark E. Basgall, pp. 111-136. Monographs in California and Great Basin Anthropology No. 5. Archaeological Research Center, California State University, Sacramento.

Derevianko, Anatoly P., and Vitaly E. Medvedev

1995 The Amur River Basin as one of the Earliest Centers of Ceramics in the Far East. In *Toadzia Kekutonondoku No Kigaen (The Origins of Ceramics in East Asia),* edited by T. Fukushi, pp. 11-26. University Press, Sendai.

Drooker, Penelope

2001 Leaving No Stone Unturned: Making the Most of Secondary Evidence for Perishable Material Culture. In *Fleeting Identities: Perishable Material Culture in Archaeological Research,* edited by Penelope Drooker, pp. 170-182. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Emery, Irene

1966 *The Primary Structure of Fabrics, an Illustrated Classification*. The Textile Museum, Washington, D.C.

Fowler, Catherine S., and Eugene M. Hattori

2011 Exploring Prehistoric Trade in Western Great Basin Textiles. In *Perspectives on Prehistoric Trade and Exchange in California and the Great Basin*, edited by Richard E. Hughes, pp. 201-220. University of Utah Press, Salt Lake City.

2012 Prehistoric Textile Trade and Exchange in the Western Great Basin: Outland Coiling and Catlow Twining. In *Meeting at the Margins: Prehistoric Cultural Interactions in the Intermountain West*, edited by David Rhode, pp. 92-102. University of Utah Press, Salt Lake City.

Fowler, Catherine S., Eugene M. Hattori, and Amy Dansie

2000 Ancient Matting from Spirit Cave, Nevada: Technical Implications. In *Beyond Cloth and Cordage: Archaeological Textile Research in the Americas*, edited by Penelope B. Drooker and Laurie D. Webster, pp. 119-140. University of Utah Press, Salt Lake City.

Glory, A.
1959 Débris de corde paleólithique á la Grotte de Lascaux [Remains of a Paleolithic cord from the Cave of Lascaux]. *Mémoires de la Société Préhistorique Française* 5:135-169.

Holmes, William H.
1884 Prehistoric Textile Fabrics of the United States, Derived from Impressions on Pottery. *Bureau of American Ethnology, Third Annual Report*, pp. 393-425. Washington, D.C.

Hyland, D.C., I.S. Zhushlikhovskaya, V.E. Medvedev, A.P. Derevianko, and A.V. Tabarev
2002 Pleistocene Textiles in the Russian Far East: Impressions from Some of the World's Oldest Pottery. *Anthropologie* 40(1):1-10.

Kvavadze, Eliso, Ofer Bar-Yosef, Anna Belfer-Cohen, Elisabetta Boaretto, Nino Jakeli, Zinovi Matskevich, and Tengiz Meshveliani
2009 30,000-Year-Old Wild Flax Fibers. *Science* 25(5946):1359.

Lamb, Sydney
1958 Linguistic Prehistory in the Great Basin. *International Journal of American Linguistics* 24(2):95-100.

Leroi-Gourhan, André
1982 The Archaeology of Lascaux Cave. *Scientific American* 246(6):80-88.

Loud, Llewellyn L., and Mark R. Harrington
1929 *Lovelock Cave*. University of California Publications in American Archaeology and Ethnology No. 25, Berkeley.

Mason, Otis T.
1885 Basketwork of the North American Aborigines. *Report of the U.S. National Museum, 1884*, pp. 291-300. Washington, D.C.

1894 North American Bows, Arrows, and Quivers. *Annual Report of the Smithsonian Institution for 1893*, pp. 631-679. Washington, D.C.

1900 Types of American Basketry. *Scientific American*, July 28, 1900.

1904 Aboriginal American Basketry: Studies in Textile Art without Machinery. *U.S. National Museum, Annual Report*, pp. 171-584. Reprint 1976, Peregrine Smith, Layton, Utah.

Minar, Jill C.
1999 *Impression Analysis of Cord-Marked Pottery, Learning Theory, and the Origins of the Alachua.* Unpublished Ph.D. Dissertation, Department of Anthropology, University of California, Riverside.

2000 Spinning and Plying: Anthropological Directions. In *Beyond Cloth and Cordage: Archaeological Textile Research in the Americas*, edited by Penelope B. Drooker and Laurie D. Webster, pp. 85-99. University of Utah Press, Salt Lake City.

Morris, Earl H., and Robert F. Burgh
1941 Anasazi Basketry: Basket Maker II Though Pueblo III. A Study Based on Specimens from San Juan Country. *Carnegie Institute of Washington, Publication* 533. Washington, D.C.

Nadel, D., A. Danin, E. Werkerc, T. Schick, M.E. Kislev, and K. Stewart
1994 19,000-Year-Old Twisted Fibers from Ohalo II. *Current Anthropology* 35:451-457.

Pepper, George H.
1902 The Ancient Basketmakers of Southeast Utah. *American Museum of Natural History, Journal II*, Guide Leaflet No. 6, New York.

Petersen, James B., Michael J. Heckenberger, and Jack A. Wolford
2001 Spin, Twist, and Twine: An Ethnoarchaeological Examination of Group Identity in Native Fiber Industries from Greater Amazonia. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope Drooker, pp. 94-113. Occasional Paper No. 28. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Soffer, Olga, and James M. Adovasio
2004 Textiles and Upper Paleolithic Lives. A Focus on the Perishable and Invisible. In *The Gravettian along the Danube*, edited by J. Svoboda and L. Sedláková, pp. 270-282. Archeologický ústav AVR, Brno.

Soffer, Olga, James M. Adovasio, and David C. Hyland
2000 The "Venus" Figurines: Textiles, Basketry, Gender, and Status in the Upper Paleolithic. *Current Anthropology* 41(4):511-537.

Soffer, Olga, James M. Adovasio, David C. Hyland, and B. Klíma
1998 *Perishable Industries from Dolní Věstonice: New Insights into the Origin of the Gravettian*. Paper Presented at the 63rd Annual Meeting of the Society for American Archaeology, Seattle.

Tuohy, Donald R., and Eugene M. Hattori

1996 Lovelock Wickerware in the Lower Truckee River Basin. *Journal of California and Great Basin Anthropology* 18:284-296.

Weltfish, Gene

1930 Coiled Gambling Baskets of the Pawnee and other Plains Tribes. *Museum of the American Indian, Heye Foundation Indian Notes*. 7(3):277-295, New York.

1932 Problems in the Study of Ancient and Modern Basket Makers. *American Anthropologist* 33:100-117.

Zhushchikhovskaya, Irina S.

1996 Current Data on the Early Pottery of Primorie Region, Russia Far East. *Journal of Korean Historical Society* 4:301-312.

1997 Current Data on the Late-Pleistocene/Early Holocene Ceramics in the Russian Far East. *Current Research in the Pleistocene* 14:89-91.

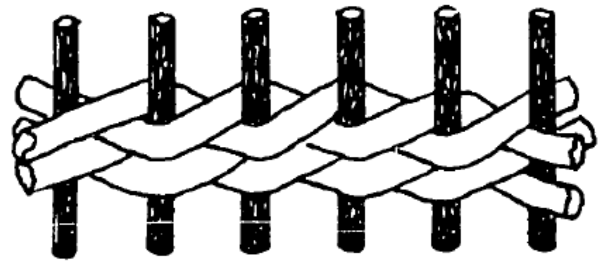

Figure 1.1. Close simple twining with S-twist (modified from Adovasio 1970a).

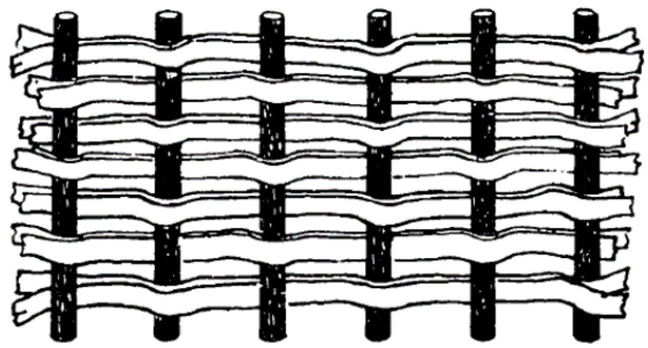

Figure 1.2. Lovelock Wickerware (modified from Adovasio 1970a).

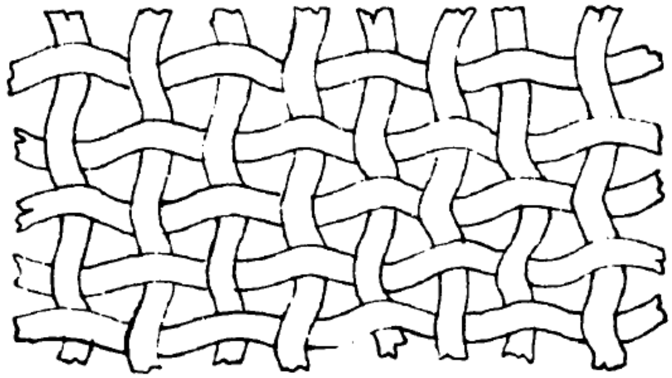

Figure 1.3. Simple plaiting (modified from Adovasio 1970a).

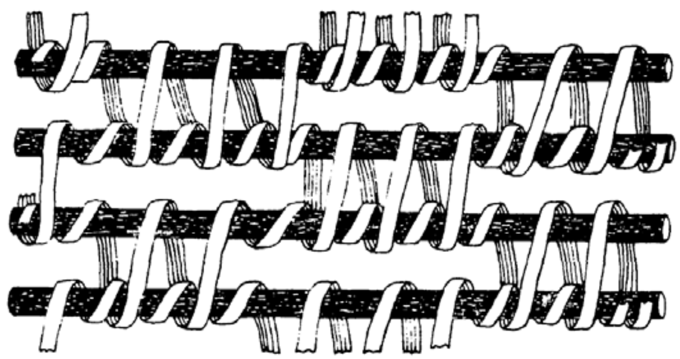

Figure 1.4. Coiled basketry with multiple stitches and wrap coiling (modified from Adovasio 1970a).

Chapter 2:

DIAGNOSTIC BASKETRY FOR TRACING PREHISTORIC POPULATIONS IN THE NORTHWESTERN GREAT BASIN

Researchers have argued that basketry technologies can be used to mark cultural boundaries. This has been accomplished in the Great Basin by examining frequencies of basketry technologies through time and space (Adovasio 1970, 1974, 1986a). Because basketry can be directly dated, researchers can determine the timing of cultural changes and cultural stability to identify when ethnolinguistic groups occupied specific sites. In this paper, I examine the frequencies of four diagnostic archaeological basketry technologies (warp-faced plain weave, Numic diagonal twining, Catlow Twine, and Lovelock Wickerware) and compare them to corresponding linguistic, ethnographic, genetic, and archaeological data to determine the ethnolinguistic affiliation of the weavers who produced those textiles. My results suggest that the ethnographic Numic groups who occupied the Great Basin were likely not related to, or were at least significantly different culturally from, the earlier prehistoric groups who occupied the region.

Introduction

Researchers have argued that prehistoric basketry is useful for evaluating possible shifts in cultural boundaries in the Great Basin (Adovasio 1975, 1977, 1980, 1986a, 1986b; Adovasio and Pedler 1994; Cressman 1942). Such arguments first arose when researchers (e.g., Cressman 1942, 1943; Heizer and Krieger 1956; Loud and Harrington 1929) working at archaeological sites containing large basketry assemblages noted technological and stylistic differences between prehistoric baskets and ethnographic baskets made by Numic-speaking Northern Paiute people who historically occupied the Great Basin. Although some researchers (e.g., Grayson 1994, 2011; Simms 2008) consider the use of artifacts for establishing linguistic and ethnic affiliations unreliable, others (e.g., Adovasio 1970, 1974, 1977, 1986a, 1986b; Adovasio and Pedler 1994; Andrews and Adovasio 1980; Andrews et al. 1986; Baumhoff 1957, 1958; King 1975; Mason 1904; Rozaire 1974) suggest that basketry may provide information regarding shifting cultural boundaries and/or "cultural frontiers" as well as cultural stability (Adovasio and Pedler 1994:114). This idea can be explored by examining the chronologies and frequencies of different basketry technologies at sites in the northern and western Great Basin. These frequencies can demonstrate when major occupations occurred at different sites, and the most common types of basketry technologies provide information about the cultural affiliation of the makers. It is important to understand that these frequencies are determined from large and small basketry fragments, but also complete or nearly complete objects. In this paper, I discuss four basketry technologies: (1) warp-faced plain weave; (2) Numic diagonal twining; (3) Catlow Twine; and (4) Lovelock Wickerware. I outline the geographic and temporal distribution of each type and how they are used to support hypothesized ethnolinguistic changes and stability in the Great Basin.

Background

Warp-Faced Plain Weave (Plaiting)

Warp-faced plain weave is the oldest diagnostic basketry type in the Great Basin. Sydney and Georgia Wheeler (Wheeler 1997) first described specimens from an archaeological context in 1940 at Spirit Cave, Nevada, (Connolly et al. 2016) although at that time its antiquity was unknown. Fifty years later, the Spirit Cave textiles were reexamined by Tuohy and Dansie (1997), who found that warp-faced plain weave pieces from Spirit Cave and other western Great Basin sites were much older than expected. Other Nevada sites with radiocarbon-dated warp-faced plain weave textiles include Spirit Cave, Grimes Burial Shelter, Crypt Cave, Chimney Cave, Hidden Cave, and Elephant Mountain Cave (Connolly et al. 2013, 2016). Nine of 10 plain weave objects known from museum collections date to between ~11,000 and ~9,600 cal B.P. (Connolly et al. 2016). The tenth piece is from Cougar Mountain Cave and is unavailable for examination. Warp-faced plain weave is a simple, flexible plaited technology in which the warp (the inactive unit) is manufactured from stems of split tule (*Schoenoplectus acutus*) and the weft (the active unit) is a 2-ply, S-spun, Z-twist (Z/ss) cordage made from dogbane (*Apocynum* spp.) and possibly big sagebrush (*Artemisia tridentata)* or juniper (*Juniperus* spp.) (Connolly et al. 2016) (Figure 2.1). It is called warp-faced because when the warps are constricted between the cordage weft pairs, the result is a warp-faced structure (Connolly et al. 2016; Fowler et al. 2000). Based on the structure of these textiles, they were most likely made using a ground loom or frame, tools that were not used during ethnographic times (Connolly et al. 2016; Fowler and Hattori 2008; Fowler et al. 2000). Warp-faced plain weave objects include mats and mat-based bags, the latter of which were made by folding mats in half and loosely stitching the lateral edges together (Connolly et al. 2016; Fowler et al. 2000). Fort Rock sandals, which range in age from 10,585 to 9,040, also found at sites in the northern Great Basin, are another case where Z/ss cordage was used (Connolly et al. 2016). Some researchers (e.g., Adovasio and

Peddler 1994; Minar 1999, 2001a, 2001b; Petersen et al. 2001) hypothesize that the directionality in the spin and twist of cordage is culturally driven.

Spirit Cave and Grimes Burial Shelter contained basketry (e.g., warp-faced plain weave matting, open-twined tule matting, close-twined bags) primarily associated with human burials. Hidden Cave, Crypt Cave, and Chimney Cave all contained warp-faced plain weave basketry fragments and have well-documented basketry collections, making them useful for discussing frequencies of this technology. Hidden Cave contained 122 pieces of basketry, of which only five pieces are plaited (four of five are Lovelock Wickerware). One piece is warp-faced plain weave, making up <1% of the total basketry assemblage. Since the main occupation of Hidden Cave was ~3,000-1,500 cal B.P., this warp-faced plain weave mat represents 100% of the textiles dating to the terminal Pleistocene/early Holocene (TP/EH) (~14,700-9,300 cal B.P.) at this site. The Winnemucca Lake Basin sites (Horse Cave, Fishbone Cave, Stick Cave, Chimney Cave, Guano Cave, Crypt Cave, and Cowbone Cave) produced 322 pieces of basketry, 72 of which were manufactured using plaited technology and two were warp-faced plain weave (<1% of the total basketry from those sites) (Table 2.1). Only two of the seven east shore sites (Crypt Cave and Chimney Cave) contained warp-faced plain weave technology. At Crypt Cave, 72 pieces of basketry were recovered, with dates ranging from ~10,400 cal B.P. to 2,000 cal B.P. (Fowler et al. 2000). Two are plaited: one is Lovelock Wickerware (undated specimen) and one is warp-faced plain weave (~10,300 cal B.P.) (<1% of total basketry assemblage and 100% of the TP/EH basketry). Chimney Cave contained 45 pieces of basketry, three were plaited examples (two [4%] Lovelock Wickerware) (undated specimen) and one piece is warp-faced plain weave (~10,400 cal B.P.) (<1% of the total basketry assemblage).

Numic Twined Basketry

Ethnographic Numic basketry in the northern and western Great Basin consists of several types of objects manufactured using twined and some coiled technology (Adovasio and Pedler 1994; Fowler and Dawson 1986). Here, I focus on the twined basketry manufactured by Numic groups. Unlike earlier twined basketry found in the region, basketry associated with Numic groups is rigid and predominantly manufactured from willow (*Salix* spp.) and generally has an S-twist weft direction. These objects include plain or diagonally open-twined burden baskets, plain open-twined cradles, plain or diagonally open-twined winnowing or parching trays, plain and diagonally open-twined seed beaters-sieves, close diagonally-twined water bottles, diagonally close-twined hats, open and diagonal close-twined boiling-mixing baskets, and diagonal close-twined eating bowls. Objects that are twined are either plain-twined with whole willow rod wefts over a willow rod warp, or diagonally-twined over two willow stick warps (Fowler and Dawson 1986). Almost all objects have an S-twist (up-to-the-right) weft direction, while earlier baskets often had the opposite (Z-twist) weft direction (Adovasio and Pedler 1994; Bettinger and Baumhoff 1982; Fowler 1994). Kelly (1932) notes that there are some Numic baskets with the opposite, Z-twist (down-to-the-right) weft direction and some baskets with weft rows where the weavers use both Z- and S-twist in the same vessel (Fowler and Dawson 1986). This could be from left-handed weavers, although Kelly (1932) believed the switch in weft direction was due to the carelessness of Paiute weavers. Washoe weavers also manufactured some diagonally twined basketry, although it was not their dominant basketry type and was likely adopted from their Paiute neighbors (Fowler and Dawson 1986). These baskets are often indistinguishable from their Paiute counterparts.

Archaeological basketry associated with Numic groups in the Great Basin is limited (Adovasio and Pedler 1994). Adovasio and Pedler (1994) describe twined seed beaters as one kind of Numic twined basketry seen in the archaeological record, but it is largely confined to Death Valley (Wallace and Taylor 1955), the Mojave Desert (Campbell 1931), and the Coso Range (Panlaquin 1974). Twined seed beaters were made ethnographically by Washoe, Shoshone, and Paiute groups and there was variation in form, from almost circular with short handles to more elongated versions. These trays were manufactured from willow and are usually plain twined with a single warp component (Fowler and Dawson 1986). Triangular twined winnowing/parching trays have been recovered from Coville Rock Shelter in Death Valley (Baumhoff 1953; Meighan 1953) and Danger Cave, Utah (Jennings 1957). Numic style basketry was also recovered from Gatecliff Shelter and other sites in Monitor Valley, Nevada (e.g., Jean Springs and Triple T Shelter) (Thomas 1979, 1983).

There are also few examples of Numic style twined basketry from archaeological contexts in the northern and western Great Basin. Loud and Harrington (1929) describe a small piece of diagonal twined basketry from Lovelock Cave, Nevada but it remains undated (Figure 2.2). Two pieces (<1% of the entire basketry assemblage) of Numic style basketry were also recovered from Dirty Shame Rockshelter in southeastern Oregon

(Andrews et al. 1986). In the Winnemucca Lake area, two Numic style baskets have been dated. The first is a close diagonally-twined winnowing tray that dates to 140 cal B.P.[1] and the second is an open-twined cradleboard that dates to 136 cal B.P.[2]. Hattori and Tuohy (1993) report a pitched diagonally twined water bottle from Waterbottle Cave near Pyramid Lake directly dated to 401 cal B.P. They note that this type of basketry technology was used by the ethnographic Northern Paiute who lived in the area and that the bottle is the earliest dated basketry item representative of that group. Other directly-dated Numic style twined objects from northwestern Nevada include a diagonally twined willow basket from Pig Rock (~136 cal B.P.[3]) and a diagonally twined willow basket fragment from Pioneer Cave (~346 cal B.P.[4]). These radiocarbon dates on Numic type twined basketry provide evidence for a relatively late occupation of the northern and western Great Basin by Numic groups. There are also late dates on coiled basketry associated with the Numa, which provide evidence for a late occupation (Jolie and Hattori 2005).

Catlow Twine Basketry

Catlow Twine basketry was likely first recovered by L.L. Loud during the initial excavation of Lovelock Cave (1911-1912) (Loud and Harrington 1929), but it was not formally named as a type until almost a decade later during Luther Cressman's (1936, 1942, 1943) investigations of northern Great Basin sites. Catlow Twine is a semi-flexible close simple twined basketry type manufactured using a Z-twist (down-to-the-right) weft direction and a two-ply, S-spun, Z-twist (Z/ss) cordage warp (Figure 2.3). Catlow Twine technology was used to manufacture mats, burden baskets, large storage containers, bowls, and trays. It was typically made using a split tule cordage warp and split tule weft, but sometimes weavers instead used cattail (*Typha latifolia*) for the weft. Catlow Twine is the dominant basketry type in the northern Great Basin and has been recovered at sites in Catlow Valley, the Fort Rock Basin, the Summer Lake Basin, and Warner Valley, as well as the Black Rock Desert and High Rock Canyon in northwestern Nevada (Adovasio 1970; Connolly et al. 1998; Connolly et al. 2016; Cressman 1942; Fowler 2014; Smith et al. 2016). Catlow Twine has also been found at sites in the Winnemucca Lake Basin and Humboldt Sink in Nevada (Hattori 1982; Heizer and Krieger 1956; Loud and Harrington 1929) and as far south as the San Francisco Bay area (Baumhoff 1958) and Barstow, California (Peck 1950). Researchers (e.g., Connolly et al. 1998; Connolly et al. 2016; Fowler and Hattori 2011, 2012; Hattori et al. 2016) believe that Catlow Twine is technologically related to ethnographic Klamath and Modoc basketry; however, until my work this relationship was never rigorously evaluated using quantitative methods (see chapters 3 and 4).

The current set of radiocarbon dates for Catlow Twine basketry is extensive (n=55); the ages range from ~7,900 to ~150 cal B.P. in the northern Great Basin and from ~9,400 to ~1,100 cal B.P. in the western Great Basin. There are presently no dated specimens from California, but California's textile record is poor and there are very few items to date. Those pieces that do exist are thought to have been potentially acquired through trade rather than made by local groups (Connolly et al. 2016; Fowler and Hattori 2011). Roaring Springs Cave and Catlow Cave 1 in Oregon's Catlow Valley each contained large, now well-documented, basketry assemblages. Cressman's (1942) and

Adovasio's (1970) descriptions of the basketry demonstrate that close simple twining with Z-twist weft direction was the dominant technology in the northern Great Basin throughout prehistory. Roaring Springs Cave has the larger of the two assemblages, with 293 pieces of basketry, 138 of which Adovasio (1970) termed Type 1 basketry. Type 1 basketry is a close simple twined technology with a Z-twist weft direction (essentially Catlow Twine). Catlow Twine makes up 47% of the total basketry assemblage from Roaring Springs Cave. Catlow Cave 1 produced 168 pieces of basketry, of which 93 (55%) are Catlow Twine. In southeastern Oregon, Dirty Shame Rockshelter also contained a large basketry assemblage but unlike Roaring Springs Cave and Catlow Cave 1 the frequency of Catlow Twine is much lower. Of the 130 pieces of basketry from the site, there are just five Type 1 basketry specimens and two of those five are described as Catlow Twine (<1% of all basketry) (Andrews et al. 1986).

Catlow Twine is also found in the western Great Basin and the earliest radiocarbon date for it is from the Winnemucca Lake area. Catlow Twine occurs in moderate numbers at some of the sites in the area including Kramer Cave, Shinners Site A, Horse Cave, Fishbone Cave, Chimney Cave, and Crypt Cave. A total of 145 pieces of basketry were found at Kramer Cave, 141 of which are twined. Of the twined basketry, Hattori (1982) described 92 (65%) as a close simple twined technology with a stitch slant, down-to-the-right (Z-twist) that contains a Z-twist cordage warp (i.e., Catlow Twine). There is one piece of Catlow Twine from Kramer Cave, which dates to ~4,250 cal B.P., which Hattori (1982) considers the major occupation period at the site. At Shinners Site A, 16 of 24 basketry pieces are twined. Only three (13%) of those pieces are Catlow Twine. Basketry from Shinners A dates between ~11,000 cal B.P. (Connolly et al. 2016: Table 3) (open twined mat, Z-twist) and ~600 cal B.P. (tule mat fragment) (Hattori 1982). Catlow Twine was likely deposited during the second occupation of the site, which dates to ~9,500-9,000 cal B.P. It makes up 20% of the total basketry for that occupation. Horse Cave contained 112 pieces of basketry and of those 31 pieces are twined. Of the 31 twined pieces, three (3%) are plain twined and contain two-element warps (i.e., Catlow Twine) (Rozaire 1974). Direct dates on basketry suggest that there were two major occupations at the site: one ~2,000-1,300 cal B.P. and one ~9,400 cal B.P. The Catlow Twine from Horse Cave dates to ~9,400 cal B.P. and makes up 25% of the basketry for that period. At Fishbone Cave, 19 pieces of basketry were recovered, 13 of which are twined, four (21%) being Catlow Twine (Hattori 1982; Rozaire 1969, 1974). Fishbone Cave basketry dates to ~2,000-1,000 cal B.P. and ~9,100-7,900 cal B.P., and Catlow Twine basketry dates fall within both of those ranges. Forty-five pieces of basketry were found at Chimney Cave and only one (2%) of the twined pieces can be considered Catlow Twine. Chimney Cave basketry dates to ~4,000-1,300 cal B.P. and ~10,400 cal B.P. Catlow Twine falls within the earlier occupation and makes up 20% of the basketry from that period. Finally, Crypt Cave contained 72 pieces of basketry, 52 of which are twined and two (3%) of which are Catlow Twine. Basketry from Crypt Cave dates to ~7,000-2,600 cal B.P. and there is one early date from the warp-faced plain weave mat (~10,300 cal B.P.). The Catlow Twine basketry falls within the earlier occupation and makes up almost 30% of the basketry from that period.

Catlow Twine occurs in low frequencies at Lovelock Cave and Humboldt Cave, both which are in the Humboldt Sink. Basketry from Lovelock Cave has been described elsewhere (Adovasio 1970; Loud and Harrington 1929) using general terms (e.g., twined, coiled, and plaited) and as such there are few details that can aid in assigning specimens to more refined basketry types such as Catlow Twine (see Loud and Harrington 1929). During my analysis of the 1,528 pieces of Lovelock Cave twined basketry housed at the Phoebe Hearst Museum of Anthropology (PHMA), I identified seven (<1%) pieces as Catlow Twine. This frequency of Catlow Twine is not representative of the entire assemblage because the Lovelock Cave collection was divided among PHMA, the Nevada State Museum, and the Museum of the American Indian. According to Heizer and Krieger (1956), Humboldt Cave contained 2,058 pieces of basketry, 16 of which they identified as Catlow Twine. Heizer and Krieger (1956) believed that the 16 fragments came from only five baskets, meaning that Catlow Twine makes up a small percentage (<1%) of the total assemblage of basketry found at Humboldt Cave. The Catlow Twine specimens came from the "upper half" of the Humboldt Cave deposits (Heizer and Krieger 1958:56), suggesting that they were deposited later in the occupation of the cave. The Lovelock Cave Catlow Twine material was found in cache pits and surface lots, also suggesting that it was a late addition to this site. Catlow Twine from both Humboldt Cave and Lovelock Cave has not yet been dated.

Lovelock Wickerware

Lovelock Wickerware was first defined by Loud and Harrington (1929) for finds made at Lovelock Cave. Tuohy and Hattori (1996:284) described Lovelock Wickerware as a "peculiar variety of rigid, simple plaiting technology indigenous to the western Great Basin". Plaiting is a subclass of basketry where single or sets of elements pass over and under each other. Like warp-faced plain weave, Lovelock Wickerware is manufactured using plaited technology, except in this case only one element (the weft) is active rather than two. The warps in Lovelock Wickerware are whole, peeled willow rods while the wefts are paired strips of split willow (Loud and Harrington 1929; Tuohy and Hattori 1996). Arrangement of the paired wefts varies; they are either side-by-side or superimposed. There are three varieties of Lovelock Wickerware weave: (1) loose weave (the wefts are loosely placed over and under the warp leaving it partially exposed); (2) tight weave (the wefts are tightly woven and adjusted so that the warp in not exposed); and (3) border weave (warp rods are gathered in pairs by two courses of twining) (Tuohy and Hattori 1996) (Figure 2.4). Lovelock Wickerware has been found at Humboldt Cave, Lovelock Cave, the Falcon Hill sites (Kramer Cave, Empire Cave, Shinners Site A, Shinners Site C, Shinners Site D, Shinners Site F, and Shinners Site I), and sites on the east side of Winnemucca Lake (Fishbone Cave, Guano Cave, Cowbone Cave, Chimney Cave, and Crypt Cave) (Hattori 1982; Heizer and Krieger 1956; Loud and Harrington 1929; Tuohy and Hattori 1996). Based on the current sample of radiocarbon dates, Lovelock Wickerware ages range from ~3,500 to ~600 cal B.P. (Ellis-Pinto 1994; Nevada State Museum 2008). Lovelock Wickerware is one of the most common artifact types from Lovelock Cave and the pieces probably represent fragments of conical burden baskets (Loud and Harrington 1929; Tuohy and Hattori 1996).

There were 1,528 basketry and mat fragments found at Lovelock Cave, and Loud and Harrington (1929) described 1,115 (73%) of them as Lovelock Wickerware. Humboldt Cave produced 2,058 pieces of basketry, 1,565 (76%) of which are Lovelock Wickerware (Adovasio 1970; Loud and Harrington 1929). Among the Falcon Hill sites, all but Shinners Site C contained less than five pieces of Lovelock Wickerware (Hattori 1982). Shinners Site C contained 321 total pieces of basketry, 209 (65%) of which are Lovelock Wickerware (Hattori 1982). Among the sites on the east side of Winnemucca Lake, all but Horse Cave and Stick Cave contained fewer than four pieces of Lovelock Wickerware. Horse Cave contained 112 pieces of basketry, 38 (34%) of which are Lovelock Wickerware. Stick Cave contained 73 pieces of basketry, 25 (34%) of which are Lovelock Wickerware.

Basketry as Material Evidence for Population Movement

Basketry has long been considered a “highly conservative” technology (Adovasio and Pedler 1994:116) because its production is based on information transmitted from one individual (e.g., mentor, role model, relative) to another (e.g., novice basket maker), usually inter-generationally. This information is often upheld through a “fixed set of standards” (Adovasio and Pedler 1994:116) that reflect what is culturally acceptable (Andrews and Adovasio 1980; Andrews et al. 1986). The same could be said about lithic technologies except that basketry often expresses minimal change or innovation unless there is a “catastrophic” contact event, in which traditional groups contact the “modern or industrialized world” (Adovasio and Pedler 1994:116). When major changes in technology or style occur in the archaeological record, it may reflect population replacement and/or shifts in cultural boundaries (Adovasio and Pedler 1994). Researchers in the Great Basin have focused on continuities and discontinuities in the region’s textile record to reconstruct prehistoric ethnolinguistic movements (Adovasio 1970, 1974, 1986b; Adovasio and Pedler 1994; Connolly and Barker 2004; Connolly et al. 2016). With improvements to radiocarbon dating techniques (i.e., Accelerator Mass Spectrometry [AMS] dating), basketry chronologies are constantly being refined to better understand the movement or replacement of populations (Adovasio 1986a; Connolly et al. 1998, 2016; Hattori et al. 2016). In the remainder of this paper, I focus on two such movements, the Numic Expansion and the Penutian Spread, and how basketry analysis has contributed to ongoing debates about both topics.

The Numic Expansion

The Numic Expansion is a hypothesized movement of Numic-speaking people out of southeastern California in a fan-like pattern across the Great Basin, moving north and east beginning about ~1,000 cal B.P. This idea was first proposed by Lamb (1958), who used glottochronology to measure the degree and timing of divergence between Numic languages. He also used this technique to determine the origin, timing, and spread of Numic speakers into the Great Basin. Lamb (1958) observed that six closely related Numic languages in the Great Basin possess differing degrees of similarities and differences to one another. Based on his analysis he combined the six individual languages into three language groups, each group containing an even more closely related pair of languages. According to Lamb (1958), some speakers of the paired languages continued to occupy the southwestern Great Basin (i.e., southeastern California) while others migrated north and east. This model is supported by differences in dialectical variation, which were greater in the southwestern Great Basin than in other parts of the region occupied by Numic groups, suggesting that the Numic languages originated in the southwestern Great Basin and spread northward and eastward. Using glottochronology, Lamb (1958) calculated that Numic groups began their outward movement ~1,000 years ago and may have only reached the termini of the fan-shaped language distribution (i.e., the northern Great Basin) during the final few centuries before Euro-American contact.

In the 60 years since Lamb (1958) first presented his model, researchers have debated when and where the Numa originated. Using linguistic data, Goss (1977, 1999) argues that Numic linguistic geography suggests that they developed in place in the central Great Basin. Hill (2002) argues that the diversity seen in the southwestern Numic languages could simply be the result of living in proximity to people speaking other California languages. She sees the expansion as a final push of Numic groups coming from the south. She refers to her model as a Numic ethnogenesis and suggests that the languages developed *in situ*. Hill (2002) also argues that maize agriculture allowed the northern Numic groups from Mesoamerica to move into land initially occupied by other hunter-gatherers. She suggests that Numic speakers arrived in the American Southwest ~4,000-3,000 years ago before later moving into the Great Basin.

Merrill et al. (2009) dismiss the idea that Numic groups brought maize agriculture with them from the south, instead arguing that it was transmitted via diffusion (i.e., moved from group to group from south to north). Merrill et al. (2009) argue that the Proto-Uto-Aztecan homeland was in central Nevada for over 10,000 years and that the Numa likely dispersed during the middle Holocene. This research is comparable to that of Aikens and Witherspoon (1986), who also suggest a central Nevada homeland for the Numa. Merrill et al. (2009) argue that if maize agriculture moved into the Southwest with groups ~4,000 years ago, then they should have also brought pottery. The archaeological evidence supports Merrill et al.'s (2009) diffusion hypothesis with no evidence of a Mesoamerican presence that would be expected with maize cultivation, and the earliest evidence of agriculture at some of these sites show continuity with foraging traditions. According to Merrill et al. (2009), the earliest AMS date for maize in the Southwest is ~4,100 cal B.P. Pottery found in the Southwest also seems to represent a local tradition rather than something brought in from Mexico and the earliest clay figurines and small vessels in the Southwest date to ~4,100 cal B.P. The earliest date for pottery in Mexico is ~4,300 cal B.P. and the morphology and size of these pieces are significantly different from those found in the Southwest (Merrill et al. 2009). Regardless, the appearance of maize agriculture is about 2,000 years earlier in Mexico than in the American Southwest. Fowler's (1983) linguistic comparison of Uto-Aztecan terms for plants and animals does not align with Merrill et al.'s (2009) hypothesis. She demonstrated that ethnographic Numic groups living in the central Great Basin not only lacked words for certain local species (e.g., oak, pinyon pine) but also possessed terms for agave and turkey, both of which are indigenous to the Southwest (Fowler 1983).

Although some linguists (e.g., Gudschinski 1956) cautioned against using glottochronology to determine time, Lamb's (1958) methods were initially accepted. Following Lamb's publication, some linguists (e.g., Rea 1958) began to test glottochronological methods using historic languages, where the timing of divergence was known. They found that glottochronology was unreliable for calculating the amount of time since languages diverged, yet subsequent glottochronological research produced similar dates for the divergence of the Numic languages (Goss 1968, 1977, 1999; Hale

1958; Miller 1966). Despite these consistencies in glottochronological results, many researchers (e.g., Grayson 2011) caution that there is no culture-free vocabulary and that linguistic change is not constant across time or space. It is important to note that Lamb (1958:98) himself cautioned that glottochronological methods offered “rough approximations” and currently, most researchers consider glottochronology to be wholly unreliable (Gray and Atkinson 2003).

While Lamb’s (1958) ideas have been disputed by linguists, his hypothesis seems to find some support in the limited genetic data available in the region. Kaestle and Smith (2001) collected mtDNA from 48 prehistoric individuals recovered from Stillwater Marsh and Pyramid Lake dating to between ~9,200 and 350 cal B.P. They compared the distributions of mtDNA haplogroups among the prehistoric sample and modern Native American groups from the Great Basin and California. Their comparison showed significant differences between ancient and modern Native Americans and demonstrated that the ancient mtDNA is more aligned with the modern inhabitants of California – specifically Penutian and Hokan speakers – who occupied areas adjacent to the historic Numic territory (Kaestle and Smith 2001). They interpret this difference as support for Lamb’s (1958) proposed Numic expansion; however, Grayson (2011) notes that there are several potential issues with this interpretation. First, mtDNA only tracks the movement of females, not entire populations. Second, the ancient “population” created by Kaestle and Smith (2001) required lumping individuals that lived thousands of years apart into a single sample, which tells us little about the genetic makeup of a group at any given time, although these data do inform us about larger scale population dynamics. Finally, if the prehistoric Stillwater group was a small and isolated population, then the genetic variation would not be great enough to separate them from possible ancestors of the Numic people from this area. Despite these shortcomings, Kaestle and Smith's (2001) mtDNA research is further supported by the work of Larsen and Kelly (1995), who used bioarchaeological data from the Stillwater Marsh population. Those data show clear distinctions between the ethnographic Numic groups and the prehistoric Stillwater Marsh population.

Ethnographic data provide compelling evidence that Numic speakers had a long history of territorial expansion using military force. Sutton (1986) describes accounts of Numic groups attacking small settlements to scare other groups and gain territory. Ethnographic accounts indicate that this behavior intensified when horses and firearms became more readily available and Numic groups continued to gain territory from their neighbors (Sutton 1986). Later, Sutton (1993) used several aspects of oral tradition (e.g., origin myths, place names and/or sacred places, reference to natural events, ethnobiological data) to explore possible population movements among Numic groups. While place names and/or sacred areas and reference to natural events were not enough to definitively support Lamb's (1958) hypothesis, origin myths suggest that that the "general tenant" (homeland, direction, and timing) of Lamb's (1958) hypothesis is correct (Sutton 1993:124). For example, Sutton (1993) notes that the Northern Paiute and Bannock moved from the south northward into Oregon, the Shoshone moved from the south northward into Idaho, and the Southern Paiute moved from the west to the east into Utah. Loud and Harrington (1929) provide ethnographic evidence from the Northern Paiute about an earlier group which occupied sites in the Humboldt Sink, Winnemucca Lake, and Pyramid Lake areas. Those earlier people were called Saiduka (tule eaters) by the Northern Paiute. The Paiute described the tule eaters as a type of mythical people having red hair and being very tall (giants). They are described by the Paiute as being related to the Pit River or Klamath tribes. Kelly (1932) discusses a similar group in her Surprise Valley Paiute ethnography but does not speak of them as red-headed giants, but does mention that they were thought to be related to the Pit River or Shasta/Hat Creek tribes (i.e., Achumawi or Atsugewi).

The archaeological record provides evidence that both supports and contradicts Lamb’s hypothesis. Potential diagnostic artifact types associated with Numic populations include projectile points, rock art, and basketry (Adovasio and Pedler 1994; Baumhoff and Byrne 1959; Bettinger and Baumhoff 1982, 1983; Delacorte 2008; Fowler 1994; Heizer and Baumhoff 1976). Site location (e.g., high altitude villages), subsistence strategies (e.g., intensified small seed and green-cone Pinyon processing), and site use have also been considered useful in identifying Numic occupations. Some researchers (e.g., Bettinger and Baumhoff 1982) have suggested that one major difference between Prenumic and Numic groups was the latter’s ability to adapt to environmental change. They have also interpreted Numic groups as being reliant on small seeds. According to Bettinger and Baumhoff (1982), Numic groups invested more time in processing lower ranked resources (i.e., small seeds) whereas Prenumic groups invested more time traveling in search of large game. This difference allowed Numic groups to outcompete Prenumic groups (Bettinger and Baumhoff 1982). Simms (1983) disagreed with Bettinger and Baumhoff (1983) because he thought their model oversimplified the differences between Numic and Prenumic groups. He notes that there was evidence that Prenumic groups also processed small seeds. Further evidence for differing subsistence strategies of

Numic and Prenumic groups comes from the analysis of assemblages from high altitude villages and adjacent hunting features in the White Mountains in eastern California and the Toquima Range in central Nevada. Noting differences in the frequencies and locations of projectile point types and radiocarbon dates associated with hunting and residential features, Bettinger (1991) hypothesized that the early use of hunting features differed from the later use of village sites. He believes that Prenumic people used high elevation areas to hunt mountain sheep and marmots while later Numic groups inhabited villages and exploited a wider range of lower ranked resources including rodents, roots, seeds, and berries (Bettinger 1991). Thomas (2014) argues that these earlier Alpine hunting features were part of an alpine hunting tradition based on male logistical hunting expeditions. Hunters traveled to these alpine areas from male-dominated sites such as Gatecliff Shelter in search of mountain sheep until sheep populations declined ~2,200 cal B.P. He agrees that later, alpine villages were occupied by mixed gender groups seeking lower ranked resources. Those groups were likely Numic speakers. Aikens and Witherspoon (1986) and Aikens (1994) argue that Numic speakers occupied the central Great Basin for over 3,500 years until ~1,000 cal B.P. when an episode of aridity severely disrupted the semi-sedentary lifestyles of the Anasazi, Fremont, Lovelock, and Chewaucanian cultures. They hypothesize when those groups moved to more well-watered areas, Numic groups took the opportunity to move into the abandoned territories.

Bettinger (2016) recently doubled down on his argument that seed intensification had major effects on the aboriginal populations of California and the Great Basin. He suggests that seed intensification paired with the use of bow and arrow technology created a more individualized economy that benefitted smaller bands. The bands could exploit areas further from wetlands and coastal areas, which extended family bands across these regions and fostered population growth. He suggests that hunter-gatherers in California and the Great Basin were continuously evolving economically, which gave them an evolutionary advantage over the less residentially-mobile Prenumic groups. Because Numic groups were more residentially-mobile, Prenumic groups who were logistically mobile were affected by the encroaching groups.

While it can be difficult to link many artifact and site types with ethnolinguistic groups, some researchers (e.g., Bettinger 1991; Delacorte 2008; Delacorte and Basgall 2012) have found that projectile point styles may serve as cultural markers in the Great Basin. Desert Side-notched (DSN) points are restricted to areas known to have been populated by Numic speaking people in the Great Basin and California during ethnographic times; therefore, they can potentially be used to track the prehistoric expansion of those groups (Delacorte 2008). According to Delacorte (2008), DSN points decrease in abundance as one moves north and east out of the purported Numic homeland (southern Owens Valley). Furthermore, radiocarbon dates associated with DSNs tend to be later in the north and east than in eastern California. He argues that both trends reflect a late Numic arrival to some parts of the Great Basin.

Rock art has also been cited as a possible marker of Numic populations. Late Holocene rock art portrays animals such as bighorn sheep, abstract shapes, and anthropomorphic figures (Bettinger and Baumhoff 1982). In contrast, Numic rock art, which is referred to as Great Basin Scratched (Heizer and Baumhoff 1976), consists of marks that are easy to make and less detailed than the presumably Prenumic styles (Bettinger and Baumhoff 1982). Great Basin Scratched typically overlies the animal and anthropomorph motifs attributed to Prenumic populations. Bettinger and Baumhoff (1982) also hypothesized that red pictographs were made during this period. They believe that in contrast to the Prenumic rock art, Numic rock art was manufactured by people who were less concerned with hunting magic and more concerned with the "defacement of Prenumic rock art" (Bettinger and Baumhoff 1982:494). Also, sites often associated with these pictographs seem to be residential and have evidence of seed gathering and processing (Bettinger and Baumhoff 1982). This evidence is in line with Bettinger and Baumhoff's (1982) ideas about Prenumic groups being travelers interested in the procurement of large game and Numic groups being processors focused on a broader range of resources such as piñon and other small seeds. However, while some Great Basin Scratched is found over earlier rock art, this is not always the case and it is a subject that requires further analysis and research (Pat Barker, personal communication, 2017).

Of all artifact types, basketry may be best suited to track the movement of Numic groups (Adovasio and Pedler 1994; Fowler 1994). For much of the Holocene, basketry in the northern Great Basin was typically made using a close simple twined technology, featured a Z-twist (i.e., down to the right) weft direction, and was mostly semi-flexible in structure (i.e. Catlow Twine). In contrast, ethnographic Numic basketry was typically a close diagonally twined basketry type, featured an S-twist (up-to-the-right) weft direction, and containers were rigid. The frequencies and locations where basketry types are found and the age of the artifacts themselves provide information about when and from where Numic populations moved. Catlow Twine basketry is found earliest at sites in the Winnemucca Lake Basin (~9,400 cal B.P. at Horse Cave) but it remained uncommon there throughout the early Holocene (just one piece). Catlow Twine from the east shore Winnemucca Lake sites continued to represent a small percentage of the basketry there (Fishbone Cave 21%, Chimney Cave 2%, Horse Cave 3%) during the early-middle Holocene, possibly signifying early but sporadic visits. In contrast, Catlow Twine makes up 65% of the total basketry assemblage from Kramer Cave (dating to the late-middle Holocene), suggesting that Prenumic groups occupied the same areas, but not necessarily the same sites, nor were they there at the same time.

The appearance of Lovelock Wickerware coincides with the drop in Catlow Twine at western Great Basin sites. Lovelock Wickerware makes up 65% of the basketry at Shinners Site C, 34% of the basketry at Horse Cave, and 34% of the basketry from Stick Cave. It is also common at Lovelock Cave (75%) and Humboldt Cave (76%), where Catlow Twine is uncommon (<1% of all basketry). Lovelock Wickerware declined substantially at sites in the western Great Basin ~1,000 years ago and disappeared from the archaeological record ~400 years ago. The earliest date for a Numic style twined basket, a pitched diagonally twined water bottle from Waterbottle Cave, is ~400 cal B.P. Other dated and late coiled waterbottles were found at Lovelock Cave (~800 cal B.P.). These dates support the hypothesized late arrival of Numic groups to the northern and western Great Basin. Additionally, some of the sites where dated Numic style basketry is found are not the same sites occupied by Prenumic groups. While there is one Numic twined basket fragment from Lovelock Cave and one from Danger Cave, a majority of this type of basketry is found in southeastern California, the purported Numic homeland.

The Penutian Spread

Cressman (1936, 1942, 1943) was one of the first researchers to recognize that northern Great Basin sites typically lacked Numic basketry. Instead, he observed that most basketry from early through late Holocene archaeological contexts was like that made by ethnographic Klamath and Modoc people (Cressman 1942). He noted that according to their oral history, the Klamath occupied a larger territory in Oregon, including an area as far east as Steens Mountain, until relatively late in time (Cressman 1942), a fact that could explain the similarity between the basketry of the Klamath-Modoc and the prehistoric human occupants.

The Penutian language family was first defined by Dixon and Kroeber (1913), who suggested a genetic relationship among groups based on lexical evidence. Sapir (1921a) later expanded the group to include populations north of California (mostly in Oregon) in what he termed Mexican-Penutian. Sapir's (1921a) Mexican-Penutian group was later supported by Greenberg (1987), who added to Sapir's (1921b) list. This linguistic research focused mainly on comparative language studies (i.e., identifying potential cognates, determining a network of small correspondences, and binary comparisons), which provides evidence that the Californian Penutian groups seem to have had three distinct migrations from the north. Whistler (1977) compared Penutian (specifically Wintuan) plant and animal names and found that many words were borrowed from neighboring California languages. He further suggested that the Penutian homeland existed in the southern Plateau and/or northwestern Great Basin.

The ethnohistoric distribution of languages in California also provides evidence for an early Penutian presence in the northwestern Great Basin. Both the Central Valley and coastal California were ethnographically occupied primarily by Penutian speakers interspersed with Hokan speakers. This was likely due to Penutian groups moving into and between areas occupied by the Hokan groups. Linguists (e.g., Miller 1966; Whistler 1977) generally attribute the Penutian dispersal into California to groups entering California from the Great Basin. This ultimately could have created the separation of the Hokan-speaking groups (Hattori 1982; Miller 1966; Whistler 1977). While the Penutian movement is agreed upon by most linguists (Miller 1966; Whistler 1977), the "specific glottochronological dates are disputed" (Hattori 1982:155; also see Miller 1966).

The presence of Penutian groups in the northern and western Great Basin is probably reflected in the form of artifacts and features such as Northern Side-notched points, pithouses, and Klamath-Modoc style basketry (Moratto 1982). Hattori's (1982) analysis of the Kramer Cave assemblage provides further evidence for a Penutian presence in northwestern Nevada during the Lovelock Period (post-4,700 cal B.P.). According to Hattori (1982), a few distinct artifacts made from non-local raw materials (e.g., marine shell beads) demonstrate that the occupants had contact with California groups. Some artifacts are also reminiscent of objects found at both Lovelock Cave and Hidden Cave; these include Little Lake projectile points, scapula sickles, incised bone spatulas, perforated stone discs, three-rod bunch coiled basketry, and flexible warp twined basketry including Catlow Twine (Hattori 1982). While Kramer Cave also contained some of these artifact types made using local materials, Hattori (1982) suggested that the shaping and style of some of those materials into Californian types (e.g., shell ornaments and beads, bone spatulas, charmstones, and scapula sickles) strengthens the connection between the inhabitants of Kramer Cave and Californian groups. The Elephant Mountain Cave bundle burials, which were wrapped in large Catlow Twine storage/burden baskets, show difference in status among these groups (Barker et al. 2012).

Delacorte and Basgall (2012) also argue for a long-standing relationship between Great Basin groups and California/Plateau groups. They demonstrate how these interactions took place through the diachronic examination of projectile point styles and obsidian sources. Delacorte and Basgall (2012) describe interactions as being flexible through time, with people having fewer boundaries during the early Holocene than during the middle Holocene. They conclude that during the middle Holocene, people in the Lahontan Basin had a northern focus, which can be seen in the appearance of substantial semi-subterranean structures and the circumscribed area in which Northern Side-notched points are found. Delacorte and Basgall (2012) suggest that during the late Holocene, there was increased sharing of ideas and goods from the Plateau and California. Such connections have been observed by other researchers (e.g., Bettinger 2016; Delacorte 2008; Hattori 1982; Moratto 1984) through the movement of toolstone, finished artifacts, and stylistic and technological similarities in house forms, burial practices, and adaptive strategies (Delacorte and Basgall 2012). According to Delacorte (2008), Penutian speakers migrated into the Great Basin from the Plateau during the early Holocene. These early settlers employed a wide-ranging settlement system that extended hundreds of kilometers along a north-south axis. As part of this system, groups from southcentral Oregon may have traveled south to Honey Lake and possibly beyond. According to

Delacorte and Basgall (2012), Northern Side-notched points are rarely found south of the Humboldt River or west of a line that extends from the Klamath Lake Basin to the Humboldt River drainage. This distribution contrasts sharply with that of early and later projectile point types, which show a wider distribution across the Great Basin. Northern Side-notched points are often made from local obsidian, which Delacorte and Basgall (2012) believe reflects the ethnolinguistic boundaries that existed during this time.

As is the case with the debate about Numic origins, basketry can contribute to our understanding of Penutian prehistory, especially in Nevada's Lahontan Basin. Burgett (2004) and Jolie's (2004) analysis of coiled basketry from Charlie Brown Cave, located in the Winnemucca Lake Basin and dated to ~1,300 cal B.P., demonstrate that it is closely related to basketry made by the ethnographic Maidu people of California. As I mentioned earlier, Cressman (1942) long ago noted both the connection between twined basketry and ethnographic Penutian-speaking Klamath and Modoc groups and the disconnect between archaeological basketry from the northern and western Great Basin and ethnographic Numic style basketry. The high frequency of Catlow Twine at sites in the northern Great Basin (e.g., Roaring Springs Cave [47%] and Catlow Cave 1 [55%]) is consistent with Delacorte and Basgall's (2012) idea that Penutian-speaking groups traveled as far south as Honey Lake.

Discussion and Conclusion

Researchers have often used basketry to identify population movements in the Great Basin. The data I presented here highlight shifts in basketry types in the western and northern Great Basin. These shifts support hypothesized movements of Penutian and Numic speakers into the Great Basin. Warp-faced plain weave occurred early (9,600 cal B.P.) in the western Great Basin and has technological affinities to Catlow Twine, which first appeared ~9,400 cal B.P. in the western Great Basin. Catlow Twine declined in the western Great Basin after the initial occupation of Kramer Cave (~4,300 cal B.P.) and continued as a dominant basketry type in the northern Great Basin until Euro-American contact. Around 3,500 cal B.P., Lovelock Wickerware appeared in the western Great Basin and was manufactured until ~380 cal B.P. at Shinners Site A. Around 1,150 cal B.P., Catlow Twine decreased in frequency around Winnemucca Lake and the Humboldt Sink, although there have been some pieces found associated with or attached to Lovelock Wickerware as patches, perhaps suggesting that Catlow Twine may have been a trade item during the Lovelock Period (Fowler 2012). North of Winnemucca Lake, Catlow Twine continued to be made, including at Last Supper Cave in northwestern Nevada, where a Catlow Twine tray dates to ~500 cal B.P. Last Supper Cave may mark the southern boundary of Penutian territory during that time. Just before the latest occurrence of Lovelock Wickerware (~380 cal B.P.), Numic style twined basketry first appeared (~400 cal B.P.). This supports an entry of Numic groups into the western Great Basin around that time.

Warp-faced plain weave basketry occurred early, and the types of objects manufactured using this technology were mats and mat-based bags (Connolly et al. 2016). These items were likely developed before they first appeared in the Great Basin. Container types also varied significantly between Prenumic and Numic groups. As I discussed earlier, some of the earliest types of vessels include mats and mat-based bags.

While there are very small quantities of those items found (<1% in the Winnemucca Lake Basin) within a highly circumscribed area of the Great Basin (the Humboldt Sink and Winnemucca Lake Basin), the way in which the items were manufactured provides significant information about the people who manufactured them. Mats and mat-based bags seem to represent groups that were mobile but spent significant time manufacturing complex basketry types using a ground loom or a frame. While the way in which mats were used is unknown, it is possible that they served as personal items that could be easily carried and used for sleeping, sitting, and also used to store the bones or cremated remains of deceased individuals. The more expedient mats used by ethnographic Klamath and Modoc groups to cover structures and floors were often open-twined and lacked the cordage warp and decorative elements seen in the early mats (Barrett 1910; Spier 1930), but open-twined split tule warp mats and bags with a cordage weft were not uncommon during the mid-late Holocene (see Heizer and Krieger 1956: Plate 25e and Loud and Harrington 1929: Figure 25k and 25i). The low frequencies of warp-faced plain weave basketry compared to Catlow Twine and Lovelock Wickerware may indicate that people invested time in manufacturing high quality personal items that could be carried, but the relative scarcity is more likely due to the high mobility seen during the TP/EH.

Due to its persistence in the region's archaeological record, Catlow Twine basketry is not a useful time-marker unless directly dated. At Elephant Mountain Cave, Catlow Twine basketry dates from ~7,900 to ~1,050 cal B.P., while at Fishbone Cave it dates from ~9,400 to ~1,100 cal B.P. The latest directly-dated piece from Fishbone Cave is a patch that was possibly used on a piece of Lovelock Wickerware, suggesting that it may have been a trade item (Fowler and Hattori 2011, 2012). Baumhoff (1958) believed that Catlow Twine was a trade item because it was difficult to make, although coiled basketry is arguably difficult to make as well. The frequencies of Catlow Twine at sites such as Lovelock and Humboldt caves are low, which also suggests it might have been a trade item, but this could reflect when the major occupation of the cave occurred (Fowler and Hattori 2012). Consistency in Catlow Twine production techniques demonstrates the conservative nature of that basketry type over time. The earliest dated Catlow Twine mats and mat fragments come from the Winnemucca Lake Basin and appeared shortly after the disappearance of warp-faced plain weave mats and bags in the western Great Basin. This suggests a technological connection between the two basketry types. Catlow Twine mats with *Apocynum* edge cords were probably also made using a loom or frame (Hattori and Fowler 2006) and both Catlow Twine and warp-faced plain weave mats and bags were manufactured using the same cordage technology (Z/ss), commonly used to make Fort Rock sandals (Connolly et al. 2016). Additionally, two mat-based bags from Spirit Cave, one close, simple twined and one open twined, were manufactured using the same technology (Z-twist weft and 2-ply S-spun, Z-twist cordage warp) as Catlow Twine (Fowler et al. 2000). The main difference is that the bags were made using dogbane cordage instead of tule cordage (Connolly et al. 2016; Fowler et al. 2000; Hattori and Fowler 2009).

The high frequencies of Catlow Twine basketry from sites like Roaring Springs Cave and Catlow Cave 1 suggest that the technology became widespread during the middle and late Holocene in the northern Great Basin. There is also a high frequency of Catlow Twine at Kramer Cave, which supports a Penutian occupation of the site ~4,300 cal B.P. (Hattori 1982). Catlow Twine was likely a widespread technology due to either multiple migrations of Penutian people into the Great Basin and California or the existence of larger cultural territories during the early and middle Holocene. While it is difficult to determine when the first migration took place, technological connections between warp-faced plain weave and plain twined technologies (i.e., close plain-twined bags with a Z-twist weft and cordage warp), dated to over 10,000 years ago, suggest that these early occupants may have been ancestral Penutian groups.

Around 4,100 cal B.P. there was a significant decrease in close simple twined basketry in the western Great Basin (Fowler and Hattori 2011, 2012). This is seen at Kramer Cave, where Catlow Twine is the majority type of basketry during the main occupation ~4,300 cal B.P. At Shinners Site C, where a piece of Catlow Twine was dated to 4,100 cal B.P., Catlow Twine is the minority type of basketry (Fowler and Hattori 2012). Based on these data and other dates from Winnemucca Lake Basin sites, Fowler and Hattori (2012) suggest that Catlow Twine likely became a trade item following the occupation of Kramer Cave.

Due to the lack of specimens from beyond the Humboldt Sink, Winnemucca Lake, and Pyramid Lake, as well as the absence of any potential antecedent technology in the Intermountain West, Lovelock Wickerware was almost certainly a local western Great Basin technology. At some of the sites, the frequency of Lovelock Wickerware seems to vary. For example, there is a high frequency of Catlow Twine and a low frequency of Lovelock Wickerware at Kramer Cave, but considering the main occupation of Kramer Cave was ~4,300 cal B.P. and one piece of Lovelock Wickerware dates to ~900 cal B.P., it is likely that the Lovelock occupation was limited and late. The opposite is true at Lovelock and Humboldt caves, where the frequency of Catlow Twine is low and the frequency of Lovelock Wickerware is high. As mentioned before, this could either mean that Catlow Twine was a trade item or that occupations by the makers of Catlow Twine were limited. Perhaps this later occupation of western Great Basin sites represents a second movement of Penutian groups into the area and the development of a localized basketry technology (Jolie 2004). An alternative view is that Lovelock Wickerware represents the appearance of Hokan (i.e., ancestral Washoe) speakers into the Great Basin (Hattori 1982).

The abrupt disappearance of Lovelock Wickerware ~600 cal B.P. suggests population movement and/or disruption likely related to the arrival of Numic populations into the western Great Basin around that time. This is in line with both Washoe and Northern Paiute oral histories that claim the earlier occupants of Lovelock Cave were either replaced by later Numic groups or retreated to wetland areas where they continued a semi-sedentary way of life. The lack of earlier Numic style basketry at sites in the northern and western Great Basin suggests that the Numa had no ties to the previous occupants of those areas. As noted earlier, genetic, ethnohistoric, and archaeological evidence collectively suggests that there was likely a population shift starting ~1,000 cal B.P. As mentioned above, dates for Numic style twined vessels range from ~401 to 136 cal B.P. Also, a relatively late date (~467 cal B.P.) on a Catlow Twine tray from Last Supper Cave suggests that Penutian groups still occupied northwestern Nevada late in time. Dates on Catlow Twine basketry from the Peninsula Site (~250 cal B.P.) (Eiselt 1997) and South Warner Cave (~640 cal B.P.) (Fowler 2014) further north in Oregon’s Warner Valley also provide evidence for a late arrival of Numic groups into the northern Great Basin.

In sum, basketry is a diagnostic artifact type that can be directly dated. Dated specimens can be used to support the timing of population movements or replacement; specifically, the movement of Numic speakers into areas once occupied by Prenumic, possibly Penutian, groups. Basketry can also be used to examine the relationships between local groups and distant and neighboring tribes. The disappearance of specific basketry types further supports this change as abrupt and possibly due to forceful occupations by better adapted Numic groups (i.e., people capable of exploiting lower ranked resources, who used bow and arrow hunting, and higher residential mobility) Numic groups. Frequencies of diagnostic basketry technology (e.g., Catlow Twine, Lovelock Wickerware, and twined Numic style basketry) and the evolution of these technologies help researchers determine when and for how long groups occupied specific locations. More importantly, both technological change and stability in basketry can offer evidence for possible connections between prehistoric and ethnographic populations and possible affiliations to ethnolinguistic groups.

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References Cited

Adovasio, James M.

1970 The Origin, Development, and Distribution of Western Archaic Textiles. *Tebiwa* 13(2):1-40.

1974 Prehistoric North American Basketry. In *Collected Papers on Aboriginal Basketry*, edited by Donald R. Tuohy and Doris L. Rendall, pp. 194-205. Nevada State Museum Anthropological Papers No. 16. Carson City.

1975 Fremont Basketry. *Tebiwa* 17(2):67-76.

1977 *Basketry Technology: A Guide to Identification and Analysis*. Aldine Publishing Company, Chicago.

1980 Fremont: An Artifactual Perspective. In *Fremont Perspectives*, edited by David B. Madsen, pp. 35-40. Antiquities Section Selected Papers, Vol. 1, No. 16. Utah State Historic Society, Salt Lake City.

1986a Prehistoric Basketry. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 194-205. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

1986b Artifacts and Ethnicity: Basketry as an Indicator of Territoriality and Population Movements in the Prehistoric Great Basin (with Rhonda L. Andrews). In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 43-89. University of Utah Anthropological Papers No. 110. Salt Lake City.

2016 *Decorated Basketry from the Great Basin and Peru*. Paper Presented at the 35th Biennial Great Basin Anthropological Conference, Reno, Nevada.

Adovasio, James M., and David R. Pedler

1994 A Tisket, a Tasket: Looking at the Numic Speakers through the "Lens" of a Basket. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by David B. Madsen and David Rhode, pp. 114-123. University of Utah Press. Salt Lake City.

Aikens, C. Melvin

1994 Adaptive Strategies and Environmental Change in the Great Basin and its Peripheries as Determinants in the Migrations of Numic-Speaking Peoples. In *Across the West: Human Population Movement and the*

Expansion of the Numa, edited by David B. Madsen and David Rhode, pp. 35-43. University of Utah Press, Salt Lake City.

Aikens, C. Melvin, and Younger T. Witherspoon
1986 Great Basin Numic Prehistory: Linguistics, Archaeology, and Environment. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 9-20. University of Utah Anthropological Papers No. 110. Salt Lake City.

Andrews, Rhonda L., and James M. Adovasio
1980 Basketry, Cordage and Bark Impressions from the Northern Thorn Mound (46Mg78), Monongahela County, West Virginia (external correlations prepared with Ronald C. Carlisle). *West Virginia Archeologist* 30:33-72.

Andrews, Rhonda L., James M. Adovasio, and Ronald C. Carlisle
1986 *Perishable Industries from Dirty Shame Rockshelter, Malheur County, Oregon*. University of Oregon Anthropological Papers No. 34. Eugene.

Barker, James P., Eugene M. Hattori, Catherine S. Fowler, and William J. Cannon
2012 *Getting Beyond the Point: Paleoindian Textiles in the Northwestern Great Basin*. Paper Presented at the 33rd Biannual Great Basin Anthropological Conference, Stateline, Nevada.

Barrett, Samuel A.
1910 The Material Culture of the Klamath Lake and Modoc Indians of Northeastern California and Southern Oregon. *University of California Publications in American Archaeology and Ethnology* Vol. 5, No. 4:240-292. Berkeley.

Baumhoff, Martin A.
1953 Minor Sites Excavated. In Colville Rockshelter, by Clement W. Meighan, Appendix A. *University of California Anthropological Records* No. 12(5). Berkeley.

1957 *Catlow Twine from Central California.* Reports of the University of California Archaeological Survey Vol. 38. Berkeley.

1958 *Excavation of Cache Cave in Pershing County, Nevada*. University of California Archaeological Survey Reports Vol. 44. Berkeley.

Baumhoff, Martin A., and J.S. Byrne
1959 *Desert Side-Notched Points as Time Markers in California.* University of California Archaeological Survey Reports No. 48. Berkeley.

Bettinger, Robert L.

1991 Aboriginal Occupations at High Altitude: Alpine Villages in the White Mountains of California. *American Anthropologist* 93(3):656-79.

2016 *Orderly Anarchy: Sociopolitical Evolution in Aboriginal California*. University of California Press, Oakland.

Bettinger, Robert L., and Martin A. Baumhoff

1982 The Numic Spread: Great Basin Cultures in Competition. *American Antiquity* 47(3):485-503.

1983 Return Rates and Intensity of Resource Use in Numic and Prenumic Adaptive Strategies. *American Antiquity* 48(4):830-34.

Burgett, Ruth B.

2004 *Coiled Basketry Designs from Charlie Brown Cave, Western Nevada*. Unpublished Master's Thesis, Department of Anthropology, University of Nevada, Reno.

Campbell, Elizabeth W.

1931 An Archaeological Survey of the Twenty Nine Palms Region. *Southwest Museum Papers* No. 7. Los Angeles.

Connolly, Thomas J., Dennis L. Jenkins, Catherine S. Fowler, Pat Barker, Eugene M. Hattori, and William Cannon

2013 *Boundaries in Space and Time: Paleo-Period Textiles in the Northern and Western Great Basin*. Poster Presented at the Paleoamerican Odyssey Conference, October 16-19, Santa Fe, New Mexico.

Connolly, Thomas J., Pat Barker, Catherine S. Fowler, Eugene M. Hattori, Dennis Jenkins, and William J. Cannon

2016 Getting Beyond the Point: Textiles of the Terminal Pleistocene/Early Holocene in the Northwestern Great Basin. *American Antiquity* 81(3):490-514.

Connolly, Thomas J., and Pat Barker

2004 Basketry Chronology of the Early Holocene in the Northern Great Basin. In *Early and Middle Holocene Archaeology of the Northern Great Basin, Oregon*, edited by Dennis L. Jenkins, Thomas J. Connolly, and C. Melvin Aikens, pp. 241-250. University of Oregon Anthropological Papers No. 62. Eugene.

Connolly, Thomas J., Catherine S. Fowler, and William J. Cannon

1998 Radiocarbon Evidence Relating to Northern Great Basin Basketry Chronology. *Journal of California and Great Basin Anthropology* 20(1):88-100.

Cressman, Luther S.

1936 *Archaeological Survey of the Guano Valley Region in Southeastern Oregon*. Studies in Anthropology, University of Oregon Monograph No. 1. Eugene.

1942 *Archaeological Research in the Northern Great Basin.* Carnegie Institute of Washington Publication No. 538. Washington, D.C.

1943 Results of Recent Research in the Northern Great Basin Region of South-Central Oregon. *Proceedings of the American Philosophical Society Symposium* 86(2):236-246.

Delacorte, Michael G.

2008 Desert Side-Notched Points as a Numic Population Marker in the Great Basin. In *Avocados to Millingstones: Papers in Honor of D.L. True,* edited by Georgie Waugh and Mark E. Basgall, pp. 111-136. Monographs in California and Great Basin Anthropology No. 5. Archaeological Research Center, California State University, Sacramento.

Delacorte, Michael G., and Mark E. Basgall

2012 Great Basin-California/Plateau Interactions along the Western Front. In *Meeting at the Margins: Prehistoric Cultural Interactions in the Intermountain West*, edited by David Rhode, pp. 65-91. University of Utah Press, Salt Lake City.

Dixon, Roland B., and Alfred L. Kroeber

1913 New Linguistic Families in California. *American Antiquity* 15(4):647-655.

Eiselt, B. Sunday

1997 *Defining Ethnicity in Warner Valley: An Analysis of House and Home*. Sundance Archaeological Research Fund Technical Report 97-2. Department of Anthropology, University of Nevada, Reno.

Ellis-Pinto, Cynthia

1994 *The Truman-Orr Basketry Collection from Winnemucca Lake Caves, Pershing County, Nevada*. Unpublished Master's Thesis, Department of Anthropology, University of Nevada, Reno.

Fowler, Catherine S.

1983 Some Lexical Clues to Uto-Aztecan Prehistory. *International Journal of American Linguistics* 49:224-257.

1994 Material Culture and the Proposed Numic Expansion. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by

David B. Madsen and David Rhode, pp. 103-113. University of Utah Press, Salt Lake City.

2014 *The View from South Warner Valley Cave: Textiles from a Looted Site and the Beginnings of the Great Basin Textiles Dating Project*. Paper Presented at the 34th Biennial Great Basin Anthropological Conference, Boise, Idaho.

Fowler, Catherine S., and Larry Dawson

1986 Ethnographic Basketry. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 705-738. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Fowler, Catherine S., and Eugene M. Hattori

2008 The Great Basin's Oldest Textiles. In *The Great Basin: People and Places in Ancient Times,* edited by Catherine S. Fowler and Don D. Fowler, pp. 61-67. School for Advanced Research Press, Santa Fe, New Mexico.

2011 Exploring Prehistoric Trade in Western Great Basin Textiles. In *Perspectives on Prehistoric Trade and Exchange in California and the Great Basin*, edited by Richard E. Hughes, pp. 201-220. University of Utah Press, Salt Lake City.

2012 Prehistoric Textile Trade and Exchange in the Western Great Basin: Outland Coiling and Catlow Twining. In *Meeting at the Margins: Prehistoric Cultural Interactions in the Intermountain West*, edited by David Rhode, pp. 92-102. University of Utah Press, Salt Lake City.

Fowler, Catherine S., Eugene M. Hattori, and Amy Dansie

2000 Ancient Matting from Spirit Cave, Nevada: Technical Implications. In *Beyond Cloth and Cordage: Archaeological Textile Research in the Americas*, edited by Penelope B. Drooker and Laurie D. Webster, pp. 119-140. University of Utah Press, Salt Lake City.

Goss, James A.

1968 Cultural-Historical Inference. In *Utaztekan Prehistory,* edited by Earl H. Swanson, Jr., pp. 1-42. Occasional Papers of the Idaho State University Museum No. 22. Pocatello.

1977 Linguistic Tools for the Great Basin Prehistorian. In *Models and Great Basin Prehistory: A Symposium*, edited by Don D. Fowler, pp. 48-70. Desert Research Publications in the Social Sciences No. 12. Reno and Las Vegas.

1999 The Yamparika – Shoshones, Comanches, or Utes – or Does it Matter? In *Julian Steward and the Great Basin: The Making of an Anthropologist*, edited by Richard O. Clemmer, L. Daniels Myers, and Mary E. Rudden, pp. 74-84. University of Utah Press, Salt Lake City.

Gray, Russell D., and Quentin D. Atkinson
2003 Language-tree Divergence Times Support the Anatolian Theory of Indo-European Origin. *Nature* 426:435-439.

Grayson, Donald K.
1994 Chronology, Glottochronology, and Numic Expansion. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by David B. Madsen and David Rhode, pp. 103-113. University of Utah Press, Salt Lake City.

2011 *The Great Basin: A Natural Prehistory*. University of California Press, Berkeley.

Greenburg, Joseph
1987 *Language in the Americas*. Stanford University Press, Stanford, California.

Gudschinski, Sarah
1956 The ABCs of Lexicostatistics (Glottochronology). *Word* 12:175-210.

Hale, Kenneth L.
1958 Internal Diversity in Uto-Aztecan: I. *International Journal of American Linguistics* 24(2):101-107.

Hattori, Eugene M.
1982 *The Archaeology of Falcon Hill, Washoe County, Nevada*. Nevada State Museum Anthropological Papers No. 18. Carson City.

Hattori, Eugene M., and Catherine S. Fowler
2006 *Early Catlow Twining in the Western Great Basin*. Paper Presented at the 30th Biennial Great Basin Anthropological Conference, Las Vegas, Nevada.

2009 Recent Advances in Great Basin Textile Research. In *Past, Present, Future Issues in Great Basin Archaeology: Papers in Honor of Don D. Fowler*, edited by Bryan Hockett, pp.103-124. USDI Bureau of Land Management, Nevada, Cultural Resource Series No. 20. Elko.

Hattori, Eugene M., and Donald R. Tuohy
1993 Prehistoric Human Occupation and Changing Lake Levels at Pyramid Lake and Winnemucca Lakes, Nevada. *Proceedings of Workshop: Ongoing Paleoclimatic Studies in the Northern Great Basin*, May 1993. USGS Circular 1119:31-34.

Hattori, Eugene M., Thomas J. Connolly, Catherine S. Fowler, Pat Barker, and Anna J. Camp
2016 *Early Catlow Twining in the Western Great Basin*. Paper Presented at the 35th Biennial Great Basin Anthropological Conference, Reno, Nevada.

Heizer, Robert F., and Alex Krieger
1956 *The Archaeology of Humboldt Cave, Churchill County, Nevada*. University of California Publications in American Archaeology and Ethnology Vol. 47, No. 1. Berkeley.

Heizer, Robert F., and Martin A. Baumhoff
1976 *Prehistoric Rock Art of Nevada and Eastern California*. University of California Press, Berkeley.

Hill, Jane N.
2002 Toward a Linguistic Prehistory of the Southwest: “Atec-Tanoan” and the Arrival of Maize Cultivation. *Journal of Anthropological Research* 58:457-475.

Jennings, Jesse D.
1957 *Danger Cave*. University of Utah Anthropological Papers No. 27. Salt Lake City.

Jolie, Edward S.
2004 *Coiled Basketry from Charlie Brown Cave, Western Nevada*. Unpublished Master’s Thesis, Department of Anthropology, University of Nevada, Reno.

Jolie, Edward S., and Eugene M. Hattori
2005 *The Spread of Coiled Basketry in the Prehistoric Great Basin*. Paper Presented at the 70th Annual Society for American Archaeology Meetings, Salt Lake City, Utah.

Kaestle, Frederika A., and David G. Smith
2001 Ancient Mitochondrial DNA Evidence for Prehistoric Population Movement: The Numic Expansion. *American Journal of Physical Anthropology* 115:1-12.

Kelly, Isabel T.
1932 Ethnography of the Surprise Valley Paiute. *University of California Publications in American Archaeology and Ethnology* 31(3):67-210. Berkeley.

King, Mary E.
1962 Archaeological Textiles. In *Irene Emery Roundtable on Museum Textiles, 1974 Proceedings*, edited by Patricia L. Fiske, pp. 9-16. The Textile Museum, Washington D.C.

Lamb, Sydney
1958 Linguistic Prehistory in the Great Basin. *International Journal of American Linguistics* 24(2):95-100.

Larsen, Clark S., and Robert L. Kelly
1995 *Bioarchaeology of the Stillwater Marsh: Prehistoric Human Adaptations in the Western Great Basin*. American Museum of Natural History Anthropological Papers Vol. 77, New York City.

Loud, Llewellyn L., and Mark R. Harrington
1929 *Lovelock Cave*. University of California Publications in American Archaeology and Ethnology No. 25. Berkeley.

Mason, Otis T.
1904 Aboriginal American Basketry: Studies in Textile Art without Machinery. *U.S. National Museum, Annual Report*, pp. 171-584. Reprint 1976, Peregrine Smith, Layton, Utah.

Meighan, Clement W.
1953 *The Coville Rockshelter, Inyo County, California.* University of California Anthropological Records No. 12(5). Berkeley.

Merrill, William L., Robert J. Hard, Johnathan B. Mabry, Gayle J. Fritz, Karen R. Adams, John R. Roney, and A.C. MacWilliams
2009 The Diffusion of Maize to the Southwestern United States and its Impact. *Proceedings of the National Academy of Sciences* 106:21019-21026.

Miller, Wick R.
1966 Anthropological Linguistics in the Great Basin. In *The Current Status of Anthropological Research in the Great Basin: 1964*, edited by Warren L. d'Azevedo, Wilbur A. Davis, Donald D. Fowler, and Wayne D. Suttles, pp. 75-111. Desert Research Institute Social Sciences and Humanities Publication No. 1. Reno.

Minar, C. Jill

1999 *Impression Analysis of Cord-Marked Pottery, Learning Theory, and the Origins of the Alachua.* Unpublished Ph.D. Dissertation, Department of Anthropology, University of California, Riverside.

2000 Spinning and Plying: Anthropological Directions. In *Beyond Cloth and Cordage: Archaeological Textile Research in the Americas*, edited by Penelope B. Drooker and Laurie D. Webster, pp. 85-99. University of Utah Press, Salt Lake City.

2001a Motor Skills and the Learning Process: The Conservation of Cordage Final Twist Direction in Communities of Practice. *Journal of Anthropological Research* 54:381-405.

2001b Material Culture and the Identification of Prehistoric Cultural Groups. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 94-113. Occasional Paper No. 28, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Moratto, Michael J.

1984 *California Archaeology*. Academic Press, Inc., Orlando.

Panlaquin, Carol

1974 *The Ray Cave Site*. Maturango Museum Monograph I, pp. 1-62. China Lake, California.

Peck, Stuart L.

1950 A Fragment of Northern California Basketry from Southern California. *American Antiquity* 16:70.

Petersen, James B., Michael J. Heckenberger, and Jack A. Wolford

2001 Spin, Twist, and Twine: An Ethnoarchaeological Examination of Group Identity in Native Fiber Industries from Greater Amazonia. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 94-113. Occasional Paper No. 28, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Rea, John A.

1958 Concerning the Validity of Lexicostatistic. *International Journal of American Linguistics* 24(2):145-150.

Rozaire, Charles E.

1969 The Chronology of Woven Materials from Seven Caves at Falcon Hill, Washoe County, Nevada. In *Miscellaneous Papers on Nevada Archaeology,* edited by Doris L. Rendall and Donald. R. Tuohy, pp. 181-186. Nevada State Museum Anthropological Papers No. 16. Carson City.

1974 Analysis of Woven Materials from Seven Caves in Lake Winnemucca Area, Pershing County, Nevada. In *Collected Papers on Aboriginal Basketry,* edited by Donald R. Tuohy and Doris L. Rendall, pp. 60-97. Nevada State Museum Anthropological Papers No. 16. Carson City.

Sapir, Edward

1921a *Language.* Harcourt, Brace and Company, New York.

1921b A Supplementary Note on Salinan and Washo. *International Journal of American Linguistics* 1(4):280-290.

Simms, Steven R.

1983 Comments on Bettinger and Baumhoff's Explanation for the "Numic Spread" in the Great Basin. *American Antiquity* 48:825-830.

2008 *Ancient People of the Great Basin and Colorado Plateau.* Left Coast Press, Walnut Creek, California.

Smith, Geoffrey M., Aaron P. Olivier, Pat Barker, Anna J. Camp, David C. Harvey, and Hillary Jones

2016 A Collection of Fiber Artifacts from Southcentral Oregon. *Journal of California and Great Basin Anthropology* 36(1):149-159.

Spier, Leslie

1930 Klamath Ethnography. *University of California Publications in American Archaeology and Ethnology* Vol. 30. Berkeley.

Sutton, Mark Q.

1986 Warfare and Expansion: An Ethnohistoric Perspective on the Numic Spread. *Journal of California and Great Basin Anthropology* 8(1):65-82.

1993 Numic Expansion in Great Basin Oral Tradition. *Journal of California and Great Basin Anthropology* 15(1):111-128.

Thomas, David. H.

1979 *Archaeology.* Holt, Rinehart and Winston, New York.

1983 *The Archaeology of Monitor Valley, 2: Gatecliff Rockshelter.* American Museum of Natural History, Anthropological Papers Vol.

59, New York City.

2014 Alta Toquima: Why did Foraging Families Spend Summers at 11,000 Feet? In *Archaeology in the Great Basin and Southwest*, edited by Nancy J. Parezo and Joel C. Janetski, pp. 130-148. University of Utah Press, Salt Lake City.

Touhy, Donald R., and Amy J. Dansie
1997 New Information Regarding Early Holocene Manifestation in the Western Great Basin. *Nevada Historical Society Quarterly* 4(1):24-53.

Touhy, Donald R., and Eugene M. Hattori
1996 Lovelock Wickerware in the Lower Truckee River Basin. *Journal of California and Great Basin Anthropology* 18:284-296.

Wallace, William J., and Edith S. Taylor
1955 Archaeology of Wildrose Canyon, Death Valley National Monument. *American Antiquity* 20(4):355-367.

Wheeler, Sydney M.
1997 Cave Burials near Fallon, Nevada. *Nevada Historical Society Quarterly* 40(1):15-17.

Whistler, Kenneth
1977 Wintun Prehistory: An Interpretation based on the Linguistic Reconstruction of Plant and Animal Nomenclature. *Proceedings of the Third Annual Meeting of Berkeley Linguistic Society* 3:157-17.

Table 2.1. Sites with two or more basketry types discussed in the text.

	DIAGNOSTIC BASKETRY TYPES					
Sites	**Warp-Faced PW[1]**	**Catlow Twine**	**Lovelock WW[2]**	**Numic Twined**	**Other Basketry**	**Total**
Northern Great Basin						
Catlow Cave 1	0 (0%)	93 (55%)	0 (0%)	0 (0%)	75 (45%)	168 (100%)
Dirty Shame RS	0 (0%)	2 (<1%)	0 (0%)	2 (<1%)	126 (>98%)	130 (100%)
Roaring Springs Cave	0 (0%)	138 (47%)	0 (0%)	0 (0%)	155 (53%)	293 (100%)
Western Great Basin						
Chimney Cave	1 (<1%)	1 (2%)	2 (4%)	0 (0%)	41 (94%)	45 (100%)
Crypt Cave	1 (<1%)	3 (3%)	0 (0%)	1 (2%)	67 (94%)	72 (100%)
Fishbone Cave	0 (0%)	4 (21%)	0 (0%)	1 (3%)	14 (76%)	19 (100%)
Horse Cave	0 (0%)	1 (3%)	38 (34%)	0 (0%)	73 (63%)	112 (100%)
Humboldt Cave	0 (0%)	5 (<1%)	1565 (76%)	0 (0%)	488 (23%)	2058 (100%)
Kramer Cave	0 (0%)	92 (65%)	1 (<1%)	0 (0%)	52 (34%)	145 (100%)
Lovelock Cave	0 (0%)	7 (<1%)	1115 (75%)	1 (<1%)	405 (>23%)	1528 (100%)
Shinners Site A	0 (0%)	3 (13%)	3 (4%)	0 (0%)	18 (83%)	24 (100%)
Shinners Site C	0 (0%)	1 (<1%)	209 (65%)	0 (0%)	111 (34%)	321 (100%)
Stick Cave	0 (0%)	1 (<1%)	25 (34%)	0 (0%)	47 (>65%)	73 (100%)

1. PW = Warp-faced plain weave
2. WW = Lovelock Wickerware

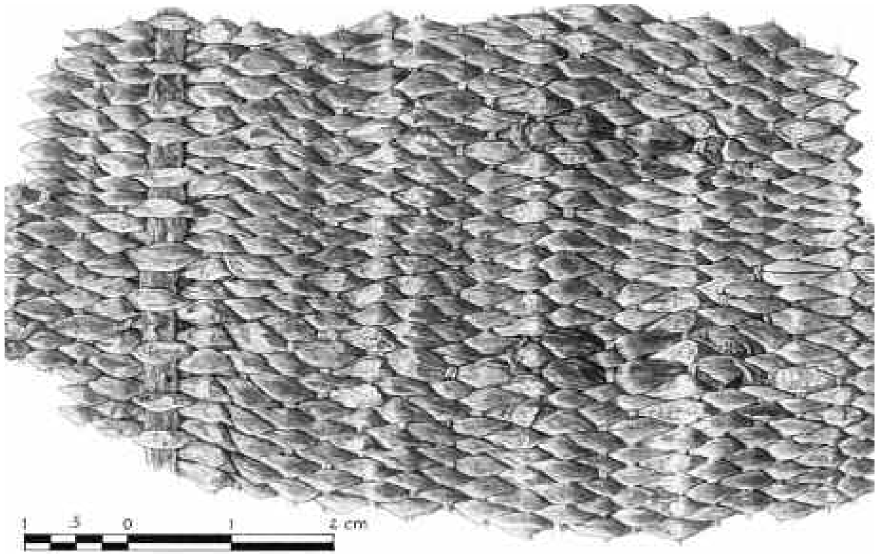

Figure 2.1. Warp-faced plain weave from Spirit Cave, Nevada (Image adapted from Connolly et al. 2016).

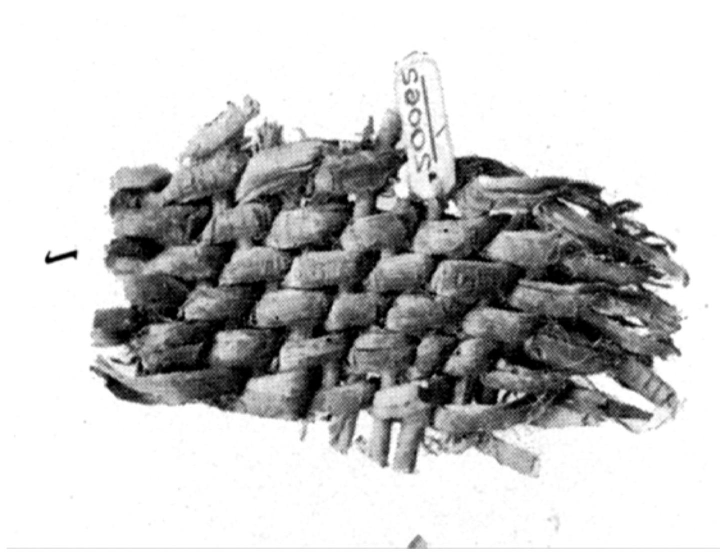

Figure 2.2. Close diagonal twine basketry fragment, with an S-twist from Lovelock Cave, NV (adapted from Loud and Harrington 1929) (image not to scale).

Figure 2.3. Catlow Twine basketry fragment with false embroidery from Fort Rock Cave (1-14707) (photograph provided by the University of Oregon MNCH).

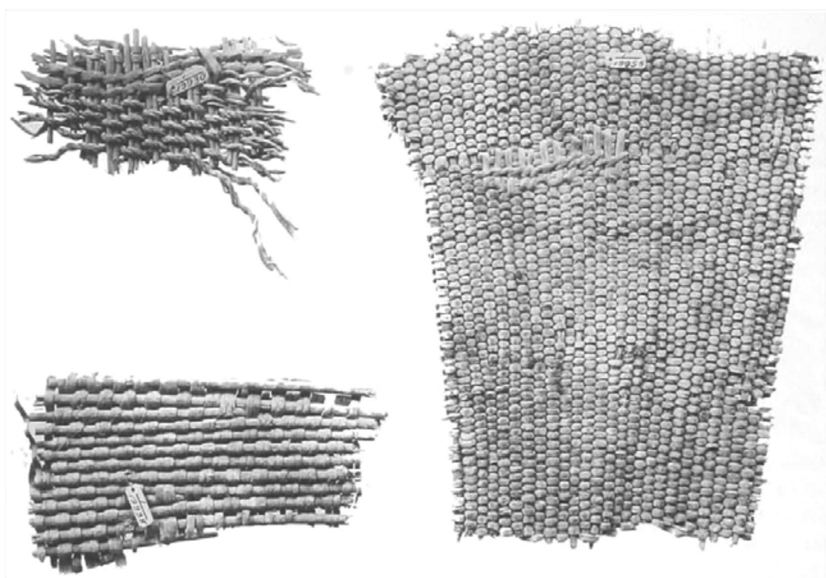

Figure 2.4. Lovelock Wickerware from Lovelock Cave: upper left, border weave (Cat. No. 19930); lower left, loose weave (Cat. No. 19938); right, tight weave (Cat. No. 19958) (photographs courtesy of Dr. Gordon Grosscup and the University of California, Berkeley) (adapted from Tuohy and Hattori 1996) (image not to scale).

Notes

1. AA-86298, 131±35 (not previously reported). Radiocarbon dates calibrated to 2σ with OxCal v.4.2 online radiocarbon program using IntCal 09 curve.
2. AA-86302, 114±36 (not previously reported).
3. Beta-330114, 120±30 (not previously reported).
4. AA-101081, 274±33 (not previously reported).

Chapter 3:

OVER 9,000 YEARS OF TECHNOLOGICAL CONTINUITY IN CATLOW TWINE BASKETRY

Researchers have suggested that Catlow Twine basketry displays technological continuity for over 9,000 years in the northern and western Great Basin, but no one has tested this hypothesis using quantitative data. In this paper, I compare the technological attributes of Catlow Twine basketry between sites and through time. My results demonstrate that Catlow Twine is a relatively homogenous type in both the northern and western Great Basin; however, there are significant gaps in the sample of dated Catlow Twine pieces that are unlikely to be a function of insufficient or biased sampling. Instead, the gaps appear to correspond to periods of site abandonment, population movement, and/or technological change.

Introduction

Over 40 years ago, Adovasio (1970, 1974, 1977, 1986a, 1986b) demonstrated that Great Basin basketry differed between regions. While some basketry types are specific to certain regions, such as Lovelock Wickerware in the western Great Basin (Loud and Harrington 1929; Tuohy and Hattori 1996), other types appear to crosscut regions, showing overlap in basketry traditions and long term, possibly fluctuating, interactions between prehistoric people in the Great Basin (Barker et al. 2012; Connolly et al. 2016; Ollivier 2016). Catlow Twine may be one such basketry type. Many researchers have argued that Catlow Twine persisted in both the northern and western Great Basin for more than 9,000 years (Barker 2012; Connolly 1994, 2011; Connolly et al. 2016; Fowler and Hattori 2007, 2011, 2012; Hattori and Fowler 2006); however, no one has rigorously evaluated this possibility using quantitative data. In this paper, I compare technological and stylistic attributes of Catlow Twine basketry dated to various periods. My results demonstrate that Catlow Twine basketry displays technological and stylistic continuity across both time and space, meaning that its makers were consistent in their manufacturing choices. If such choices reflect ethnolinguistic group membership (Adovasio 2016; Adovasio and Peddler 1994), then this consistency may indicate that the makers of Catlow Twine basketry were members of a single ethnolinguistic group that occupied a large territory within the northwestern Great Basin for a very long time.

Background

Catlow Twine basketry is found predominantly in northwestern Nevada, southeastern Oregon, and parts of California (Barker et al. 2012; Baumhoff 1957; Cressman 1942; Fowler and Hattori 2007, 2011, 2012; Hattori 2006). It was originally proposed as a formal basketry type by Alex Krieger (Cressman 1942) and subsequently adopted by other researchers (Adovasio 1970; Barker et al. 2012; Baumhoff 1957; Connolly 1994; Connolly et al. 1998; Connolly et al. 2016; Fowler and Hattori 2007, 2011, 2012; Hattori and Fowler 2006). Catlow Twine is close, simple twined basketry with a Z-twist (down-to-the-right) weft direction and a two-ply cordage warp (Z/ss) (Figure 3.1). It is semi-flexible and predominantly manufactured using split tule (*Schoenoplectus acutus*) and cattail (*Typha* sp.) wefts and tule warps (Cressman 1942). Catlow Twine was frequently decorated using one or more techniques such as multicolored wefts, simple twined overlay using whole and half twists, wrapped twine overlay, false embroidery, and sometimes three strand (triple weft) twining (Connolly et al. 2016; Fowler and Hattori 2011, 2012). Materials used for decoration included grass or cane leaf (*Phragmites australis*), mud- or sun-dyed tule and cattail, tule root, and dyed porcupine quills (Connolly et al. 2016; Cressman 1942; Fowler and Hattori 2007; Gogol 1983; Shanks 2015).

Cressman's (1942) *Archaeological Researches in the Northern Great Basin* provided one of the first detailed analyses of basketry from northern Great Basin sites. Cressman (1936, 1942, 1943) considered Roaring Springs Cave in Oregon's Catlow Valley the type site for Catlow Twine basketry because it contained numerous baskets and basketry fragments that shared similar technological and stylistic attributes. Nearby Catlow Cave 1 also contained examples of Catlow Twine basketry as did many other caves and rockshelters between Catlow Valley and the eastern boundary of the historic/ethnographic Klamath territory.

Other sites with Catlow Twine basketry include Guano Valley Cave, the Warner Valley caves (i.e., South Warner Cave, Little Steamboat Point 1, and Plush Cave), the Paisley Five Mile Point Caves, and Massacre Lake Cave (Cressman 1942). Heizer (1942) described the basketry from Massacre Lake Cave in northwestern Nevada and the Petroglyph Point Caves in northeastern California as close, simple twined that looked "Oregon-like" (Cressman 1942:123) and subsequent analyses confirmed that many specimens are indeed Catlow Twine (Connolly et al. 1998; Fowler and Hattori 2007, 2011, 2012; Hattori and Fowler 2006). Researchers (e.g., Heizer and Krieger 1956; Loud and Harrington 1929) also described textiles from Lovelock and Humboldt caves in western Nevada as close, simple twined tule basketry with Z-twist wefts and cordage warps, all hallmarks of Catlow Twine basketry. Following these initial publications, Catlow Twine became an established basketry type that has been identified at sites as far north as Fort Rock and Fort Rock Crater caves (Bedwell 1973; Cressman 1936, 1942), as far west as Altamont Cave in the San Francisco Bay area (Baumhoff 1957), and as far south as Barstow and California's Central Valley (Connolly 2016; Peck 1950) (Figure 3.2). Cressman (1942) suggested that the makers of Catlow Twine were likely related to the ethnographic Klamath and Modoc people. He later stated that "historic Klamath basketry is lineally descended from the fine basketry of the prehistoric period" based on the long and well-developed skill of twined basket making (Cressman 1986:123).

Adovasio (1970, 1977, 1986a, 1986b) standardized terminology for basketry analysis in the Great Basin and identified three distinct basketry centers: Northern (NBC); Western (WBC); and Eastern (EBC) (see Figure 3.2). Adovasio (1970) delineated these centers based on the relative frequencies of different basketry technologies. Using radiocarbon dates and stratigraphic information from archaeological sites in the northern and western Great Basin, Adovasio (1970) recognized three chronological stages in the NBC: Stage 1 (~12,000-7,800 cal B.P.); Stage 2 (~7,800-950 cal B.P.); and Stage 3 (~950-400 cal B.P.). He recognized five chronological stages in the WBC: Stage 1 (~12,700-7,400 cal B.P.); Stage 2 (~7,400-4,400 cal B.P.); Stage 3 (~4,400-3,100 cal B.P.); Stage 4 (~3,100-900 cal B.P.); and Stage 5 (~900-150 cal B.P.). Adovasio (1970) noted that simple flexible and semi-flexible twined basketry, including Catlow Twine, first appeared during Stage 1 in the NBC and continued through Stage 3. In the WBC. It also first appeared during Stage 1 and persisted until the end of Stage 4 (Adovasio 1970). Beginning in the 1980s, Accelerator Mass Spectrometer (AMS) radiocarbon dating enabled researchers to date extremely small textile samples. Using this method, the number of directly dated textiles greatly increased, and researchers now address increasingly fine-grained questions about when, where, and how basketry technology developed and spread in the Great Basin (Connolly et al. 1998; Connolly et al. 2016). In the remainder of this paper, I employ that approach to test the hypothesis that Catlow Twine basketry persisted unchanged in the NBC and WBC for much of the Holocene.

Materials and Methods

To test the hypothesis that Catlow Twine persisted unchanged for millennia across the NBC and WBC, I analyzed basketry from archaeological sites in Nevada and Oregon curated at the Nevada State Museum (NSM), University of Oregon Museum of Natural and Cultural History (MNCH), and University of California, Berkeley's Phoebe A. Hearst Museum of Anthropology (PHMA). Due to the unstandardized nature of basketry terminology in early publications (Heizer and Krieger 1956; Loud and Harrington 1929; Rozaire 1969, 1974; Weltfish 1930, 1932), one of my first tasks was to identify which sites contained Catlow Twine specimens. Using published descriptions, tables, and photographs of basketry, I identified sites with possible Catlow Twine specimens and subsequently examined close simple twined basketry in those collections to identify pieces that were Catlow Twine (i.e., close simple twined, cordage warp with a Z-twist weft). I also looked at other close simple twined technology to see if there were possible variants of Catlow Twine and to further improve my understanding of the technological evolution of twined basketry in time and space. From that larger sample, I selected a smaller sample of specimens that: (1) had been previously radiocarbon-dated; (2) were available for radiocarbon dating; and/or (3) possessed attributes beyond basic wall construction (e.g., decoration, start, selvage type) that could yield information about technological and stylistic choices. I recorded attribute data for each specimen using a standardized twine basketry analysis form adapted from Adovasio (1977); these include: (1) features of wall construction (weft direction, construction of warp unit [warp spin and twist] and warp and weft insertion [warp and weft splicing]); (2) starting technique; (3) rim finish; (4) decoration type; (5) decoration design; and (6) vessel type.

In total, I identified 89 specimens from 32 sites in the northwestern Great Basin that either had been radiocarbon dated (39 pieces from 31 sites) or could be radiocarbon dated and possessed attributes beyond those related to wall constructions (Table 3.1). I submitted an additional 15 specimens for AMS dating; these include 12 pieces from Last Supper Cave, two pieces from Catlow Cave 1, and one from Dirty Shame Rockshelter, bringing the total number of dated Catlow Twine specimens to 55 (Table 3.2). To evaluate the likelihood that this sample represents a robust and unbiased record of Catlow Twine basketry in the region, I applied Rhode et al.'s (2014) method of determining the likelihood that any observed gaps in a radiocarbon sequence are products of sampling error or if they instead reflect other factors (e.g., site abandonment, population movements, technological change). Rhode et al.'s (2014) model of uniform-frequency assumes a constant probability of occupation intensity or, in this case, the frequency of Catlow Twine, through time. Equation 4 ($f(t) = 1 - e^{-t/\beta}$) is a "cumulative negative exponential distribution [which] describes the probability of a waiting time of at least duration *t* before observing the first event" (Rhode et al. 2014:568). This determines the probability of long gaps occurring between radiocarbon dates. β represents the average gap length and *t* is the maximum gap length in question. Equation 5 ($P_N\ (n_1) = \frac{N!}{n_1!(N-n_1)} P^{n_1} q^{N-n_1}$) determines if each gap in a sequence is less than or equal to the largest observed gap. *P* represents the probability that any gap is less than or equal to the largest observed gap, *q* represents the probability of any gap being greater than the largest gap (merely the reciprocal of *p*), and *N* represents the total number of gaps in the sequence. I used this approach to determine if Catlow Twine basketry continuously spanned 9,000 years in the northwestern Great Basin.

To determine if Catlow Twine remained unchanged across both time and space, I assigned dated specimens to one of four periods: (1) the terminal Pleistocene/early Holocene (TP/EH) (~14,700-9,300 cal B.P.); (2) the middle Holocene (~9,300-5,100 cal B.P.); the late Holocene (~5,100-300 cal B.P.); and (4) the contact period (~300 cal B.P.-Present) (Grayson 2011). To determine if Catlow Twine varied across space, I split the sample of Catlow Twined basketry into two regions based on the locations of the sites from which it originated: (1) the NBC; and (2) the WBC. I examined these samples for differences and/or similarities in technological and stylistic attributes.

Using these materials and methods, I developed three expectations related to the hypothesis that Catlow Twine basketry persisted unchanged for over nine millennia in the northwestern Great Basin. First, there should be no major gaps in the radiocarbon sequence of dated specimens from the region. Second, there should be no significant differences in attributes, which are either the technological (e.g., wall construction, starts/finishes, warp and weft insertion or splicing) or stylistic (e.g., decoration type, motif) in earlier and later specimens. Finally, there should be no significant differences in the technological and stylistic attributes of specimens from the NBC and WBC.

I also compared two additional wall attributes: warp and weft insertion (i.e., splicing). There are three ways in which new warps can be added or split to increase the size of a twined basket (see Adovasio 1977 for descriptions of each type). For this analysis, I named these types Warp Type 1a, 1b, 2a, 2b, and 3 based on their descriptions and the sequence in which they appear in Adovasio (1977). Weft splicing is also an attribute of twined basketry wall construction and there are six ways in which weavers accomplish this task, which I named Weft Type 1a, 1b, 1c, 1d, Type 2, and Type 3, again based on their order of appearance in Adovasio (1977).

I compared four additional attributes unrelated to wall construction: (1) start and selvage types; (2) decorative elements; (3) decoration designs; and (4) vessel types. Cressman (1942) described three ways to start a Catlow Twine basket, which are variations of a single basic technique. I named these Start Type 1a, 1b, and 1c based on their order of appearance in Cressman (1942). While Cressman observed three start types for Catlow Twine basketry in the northern Great Basin, I ultimately only identified two start types in my sample (Start Type 1a and Type 1b). Due to the small sample of dated specimens with intact starts (n=3), I could not compare start types across time but did compare them across space.

Cressman (1942) described one Catlow Twine selvage type: when the maker trims the warp flush with the final weft row. Kallenbach (2013) subsequently identified a second selvage type on a Catlow Twine tray and large storage basket from Oregon’s

Chewaucan Cave. This selvage type is manufactured by folding the warp ends over and fastening them to the adjacent warp with the final weft row. I named these selvage types based on the order of their appearance in Adovasio (1977). Adovasio describes 10 selvage types (1-10), with Type 7 having five variations (Selvage Type 7a, 7b, 7c, 7d, 7e). I found no discussion of selvage types for Catlow Twine mats in Cressman (1942); therefore, I used Adovasio’s (1977) descriptions of variations of what he calls continuous weft selvages for simple twined mats. I named mat selvage types (Type 1a, 1b, 1c, 1d) according to the order in which they are described by Adovasio (1977:35-37). While I recorded selvage type (when present) for each specimen, due to a lack of three-dimensional vessels containing intact selvage types in the WBC, I ultimately could not compare that attribute across either time or space.

Cressman (1942) outlined several methods of decorating Catlow Twine basketry: (1) plain overlay, with one or two strands; (2) wrapped twine overlay; (3) false embroidery; (4) dyes wefts; or (5) a combination of these methods. For this paper, I used only the primary decoration types for each specimen, which include: (1) overlay; (2) false embroidery; (3) S-twist (down-to-the-left); and (4) triple weft twining (the addition of a third weft). Due to the small sample of TP/EH baskets (*n*=3), I ultimately only compared decoration types for middle and late Holocene baskets.

I classified decoration designs using four categories based on the basic motif of the design: (1) checkering; (2) concentric circles; (3) triangles, rectangles, and squares; and (4) lines and bands. Due to the small number of directly dated specimens with designs (*n*=4), I ultimately could not compare decoration designs across time but was able to compare them across space.

Finally, I compared vessel types, which I identified by examining several attributes (e.g., selvage, vessel shape, start type). From the overall sample (n=89), I could confidently assign 31 specimens to a vessel type. Among the dated sample (n=55), I could only assign two TP/EH and three middle Holocene specimens to vessel types; therefore, I ultimately combined those periods and compared them to the late Holocene sample.

Results

Evaluating the Sample of Directly-Dated Catlow Twine Basketry

The 55 radiocarbon dates obtained on Catlow Twine specimens span 8,225 ^{14}C years. The average gap ($e\hat{}(-t/\beta)$) length is 152.31 ^{14}C years. Within the radiocarbon sequence, there are three gaps that are significant (p<0.05): (1) 8,140-7,100 ^{14}C B.P. (1,040 ^{14}C years); (2) 6,118-5,102 ^{14}C B.P. (1,016 ^{14}C years); and (3) 3,656-2,253 ^{14}C (1,403 ^{14}C years) (Table 3.3).

The earliest significant (p=.001) gap (1,040 ^{14}C years) falls between 8,140 and 7,100 ^{14}C (~9,088-7,920 cal B.P.[1]). This gap is likely simply a function of gaps in the radiocarbon records of the sites included in my sample, although Connolly et al. (2016) suggest that Catlow Twine technology could have originated or evolved from a preexisting basketry technology referred to as warp-faced plain weave, which is found mostly in the WBC except for Elephant Mountain Cave and Cougar Mountain Cave (undated) (Cowles 1959: plate 33). This could suggest an origin of Catlow Twine in the

Winnemucca Lake area towards the end of the TP/EH because that is where the earliest dated specimen has been recovered (Connolly et al. 2016). The second significant (*p*=.001) gap (1,016 ^{14}C years) falls between 6,118 and 5,102 ^{14}C B.P. (~7,018-5,831 cal B.P.). This gap corresponds with middle Holocene hiatuses in many cave and rockshelter occupations in both the northern Great Basin (e.g., Catlow Cave 1, Elephant Mountain Cave, Fort Rock Cave, the LSP-1 Rockshelter, Last Supper Cave, the Paisley Five Mile Point Caves, and Roaring Springs Cave) and western Great Basin (Crypt Cave and Fishbone Cave) (Ollivier 2016). The third significant (p<.001) gap (1,403 ^{14}C years) is between 3,656 and 2,253 ^{14}C B.P. (~3,986-2,249 cal B.P.). This gap also corresponds with apparent hiatuses at Catlow Cave 1, Elephant Mountain Cave, the LSP-1 Rockshelter, the Paisley Five Mile Point Caves, and Roaring Springs Cave (Ollivier 2016). After ~2,800-1,800 cal B.P., there is a sharp increase in occupations at Catlow Cave 1, Elephant Mountain Cave, Last Supper Cave, the LSP-1 Rockshelter, the Paisley Five Mile Point Caves, and Roaring Springs Cave (Ollivier 2016). This increase in occupation corresponds with an increase in the number of the dated Catlow Twine basketry pieces from those and other sites (see Table 3.2).

It is possible that the observed gaps may be caused by the fact that the majority (*n*=36) of Catlow Twine dates occur relatively late (after 2,253 ^{14}C years); therefore, I calculated the gaps using the 17 dates preceding 2,253 ^{14}C years, which span 4,714 ^{14}C years, have 16 gaps, and have an average gap length of 294.6 ^{14}C years (Table 3.4). By decreasing the number of dates there is less date coverage, which increases the probability of having gaps of a certain length. For example, two of the gaps that are >1000 ^{14}C years are still significant ($p \leq 0.05$); specifically, the gaps between 8,140 and

7,100 ^{14}C B.P. (~9,088-7,920 cal B.P.) (1,040 ^{14}C years) and 6,118-5,102 ^{14}C B.P. (~7,018-5,831 cal B.P.) (1,016 ^{14}C years). The earliest gap in the dates occurs just after the onset of the middle Holocene and the second gap falls toward the end of the middle Holocene. The corresponding hiatuses in cave and rockshelter occupations during the middle Holocene are likely the reason for these gaps in the Catlow Twine sequence.

Technological Attributes Across Time and Space

My comparison of wall construction attributes suggests considerable continuity across time (Table 3.5). All of the Catlow Twine baskets (*n*=89) contained a Z-twist weft stitch slant, demonstrating no variation in this attribute through time (or between the NBC and WBC for that matter). Typical Catlow Twine warp construction (i.e., S-spun, Z-twist, two-ply [Z/ss], cordage warp) is also present in all specimens. Over half (*n*=52; 59%) of the sample featured Warp Type 1a warp splicing (Figure 3.3). The remaining specimens (*n*=37; 41%) displayed no evidence of the insertion of new warps, likely because the pieces are too fragmentary to preserve that attribute. Like warp splicing, only one technique (Weft Type 1d) for adding new weft strands (i.e., weft splicing) is represented in the sample (Figure 3.4). It is present in 62 specimens (70%); the remainder of the sample (*n*=27; 30%) contained no evidence of warp splicing likely due to the fragmentary nature of those specimens.

Two start types (Start Type 1a and Type 1b) (Figure 3.5) are represented in the sample, although Type 1b only occurs in the Catlow Twine baskets from Chewaucan Cave. Those baskets (one large tray and one large storage basket) have not been directly dated but a piece of associated netting was dated to ~397 cal B.P., suggesting that the baskets also date to the very late Holocene (Kallenback 2013). These vessels, which are two of the latest Catlow Twine baskets, possess selvage types not commonly seen in Catlow Twine specimens but often seen in Klamath and Modoc baskets (Camp 2016). Despite this fact, there is no significant difference (Fisher's Exact Test, p=.580) between middle and late Holocene Catlow Twine starts (Table 3.6), nor is there a significant difference (Fisher's Exact Test, p=.999) in how Catlow Twine starts were manufactured in the NBC and WBC (Table 3.7). When comparing dated Catlow through time, there is only one Catlow Twine vessel (a bowl from Massacre Lake Cave) with intact selvage; the other dated pieces with remaining selvage are parts of mats from Horse Cave and Fishbone Cave which possess the same type of side selvage, meaning I could not compare selvage types across time. My sample of Catlow Twine basketry had very few vessels with remaining selvages (i.e., rim or finish) (n=15; 17%) and all NBC finishes were from three-dimensional objects (i.e., trays and bowls) whereas all WBC (n=3) finishes were side selvages from flat mats. As such, they are not directly comparable.

Stylistic Attributes and Vessel Types Across Space and Time

There is a significant difference (Fisher's Exact Test, p=.050) in decoration type between the middle and late Holocene samples (Table 3.8), which is likely due to the large number (n=26) of late Holocene baskets with overlay. While decoration type appears to vary diachronically, decoration types (e.g., S-twist, overlay, false embroidery, and triple weft twining) in NBC and WBC samples do not (Fisher's Exact Test, p=.068)

(Table 3.9). Finally, there is no significant difference (Fisher's Exact Test, p=.070) in decoration designs between the middle and late Holocene samples (Table 3.10), nor is there a significant difference (Fisher's Exact Test, p=.190) in design types between NBC and WBC samples (Table 3.11).

Vessel types do not differ significantly across time (Table 3.12). While over half (n=51; 58%) of the specimens in my sample are wall fragments that cannot be attributed to vessel types, there are numerous examples of trays, mats, burden baskets, bowls, and storage baskets. A Fisher's Exact Test indicates that there is a significant difference (p=.045) in vessel type between the NBC and WBC (Table 3.13). This is likely due to the large number (n=10) of Catlow Twine trays from the NBC compared to the WBC where there is only one tray.

Discussion and Conclusion

The current sample of directly-dated Catlow Twine basketry suggests that the type could have first emerged in the Winnemucca Lake area during the early Holocene and subsequently spread northward into the Black Rock Desert and beyond. A large gap between 8,140 and 7,100 ^{14}C B.P. (1,040 ^{14}C years) occurs between one of the earliest dated Catlow Twine piece from Shinners A (~9,088 cal B.P.) near Winnemucca Lake and a somewhat later piece from Elephant Mountain Cave (~7,920 cal B.P.), located ~100 km further north in the Black Rock Desert. Connolly et al. 2016 (also see Fowler and Hattori 2010) have argued that warp-faced plain weave technology found at sites such as Spirit Cave, Grimes Shelter, Hidden Cave, Chimney Cave, and Elephant Mountain Cave, Nevada (Barker et al. 2012; Connolly et al. 2016; Fowler et al. 2000; Tuohy and Dansie 1997) could be the antecedent to Catlow Twine. This technology predates Catlow Twine basketry in the WBC and like Catlow Twine it is also manufactured by weavers that used Z/ss cordage technology, the difference being that the weft is *Apocynum* cordage while the warps are single strips of tule. Additional evidence that early groups used Z/ss cordage warp technology is found in Fort Rock sandals from the northwestern Great Basin, examples of which predate the earliest Catlow Twine specimens (Connolly et al. 2016). The warp-faced plain weave basketry and Fort Rock sandals indicate that regardless of where exactly Catlow Twine originated, simple twine technology and use of tule and cordage for textile production were well-established long before Catlow Twine first emerged. Based on ethnographic observations, some researchers (e.g., Minar 2000, 2001a, 2001b; Petersen et al. 2001) believe that manufacturing choices such as the spin and twist of cordage may be linked to group identity/membership and resistant to change (Adovasio 2016; Adovasio and Peddler 1994; Andrews et al. 1986). If these assertions are correct, then the shared presence of Z/ss cordage in earlier warp-faced plain weave basketry and Fort Rock sandals as well as slightly later Catlow Twine basketry may indicate that these basketry types were made by related populations.

The second large gap in the Catlow Twine record, which falls between 6,118 and 5,102 ^{14}C B.P. (1,016 ^{14}C years) (~7,018 and 5,831 cal B.P.), probably corresponds more with a regional reduction in cave and rockshelter use during the middle Holocene (Bedwell 1973; Grayson 2011; Jenkins et al. 2004) and less with a reduction in the use of Catlow Twine basketry. As I noted earlier, Last Supper Cave, Dirty Shame Rockshelter, Catlow Cave 1, and Roaring Springs Cave all produced Catlow Twine specimens included in my study and exhibited substantial gaps in their radiocarbon records and/or low numbers of diagnostic middle Holocene artifacts (e.g., Northern Side-notched points) (Ollivier 2016). Open-air sites dating to the middle Holocene cluster around reliable water sources in the northwestern Great Basin (Fagan 1974; Helzer 2004; O'Connell 1975), which can mean that while groups did not completely abandon the region, they did refocus their settlement-subsistence systems around places where perishable artifacts tend not to preserve. The groups who reoccupied many caves and rockshelters in the NBC and WBC near the end of the middle Holocene brought Catlow Twine basketry with them and either discarded, lost, or cached specimens at sites across the region.

The third significant gap in Catlow Twine dates falls between 3,656 and 2,253 ^{14}C (1,403 ^{14}C years) (~3,986 and 2,249 cal B.P.) This gap is also probably related to hiatuses at Catlow Twine-bearing sites in the NBC and the WBC (e.g., Last Supper Cave, the LSP-1 Rockshelter, Catlow Cave 1, Paisley Cave 1, Elephant Mountain Cave) (Ollivier 2016). After ~2,000 cal B.P., dates for Catlow Twine basketry increase significantly and roughly two-thirds (*n*=33) of all directly dated specimens fall within this period. This could be due to excellent preservation at these sites, but it is perhaps more likely due to increased populations (Grayson 2011; Louderback et al. 2010; Smith 2011) and/or cave and rockshelter use during the late Holocene. During the last 2,000 years, Catlow Twine was the dominant textile technology in the NBC, but it was no longer used in the WBC (Fowler and Hattori 2011, 2012). There, the latest date (~1,100 cal B.P.) on Catlow Twine is on a piece from Fishbone Cave that appears as a patch on a Lovelock Wickerware burden basket of roughly the same age (Fowler and Hattori 2011, 2012). Similar examples of Catlow Twine patches on vessels produced using other technologies have been reported from Lovelock Cave and several Winnemucca Lake sites (Rozaire 1974). Fowler and Hattori (2011, 2012) have suggested that the plain weave used in Lovelock Wickerware is not inherently stable and fragments of semi-flexible Catlow Twine make an excellent patch. It was either traded or recycled by theses later occupants. Either way Catlow Twine was manufactured much less in the WBC after ~1,000 cal B.P., signaling that new groups began to occupy the western Great Basin around that time.

Catlow Twine basketry continued to be dominant in the NBC until Euro-Americans arrived in the region. While there are some minor stylistic differences between archaeological and ethnographic textiles in the northern Great Basin, there are far more similarities (see Chapter 4). This apparent continuity may shed some light on the ongoing debate over when and from where Numic groups originated and spread throughout the Great Basin. Some researchers (e.g., Bettinger and Baumhoff 1982; Lamb 1958; Madsen and Rhode 1994) suggest that the Numic Expansion began around 1,000 years ago in eastern California and brought the Northern Paiute into the northwestern Great Basin sometime after that. While not everyone agrees on this model of Numic origin (see Aikens 1994; Aikens and Witherspoon 1986), various studies of language (Lamb 1958), oral histories (Sutton 1986, 1993), DNA (Kaestle and Smith 2001), and archaeological evidence (Madsen and Rhode 1994) support this hypothesis. My analysis indicates that Catlow Twine basketry was replaced ~1,000 years ago in the WBC by other technology (initially Lovelock Wickerware and, later, rigid simple and diagonal twined basketry with S-twist wefts) but persisted in the NBC until Euro-American arrival. This model also supports the idea that the Numa spread into the northwestern Great Basin relatively recently from a southern origin.

There appears to be minimal variation in how prehistoric people manufactured Catlow Twine basketry over the course of 9,300 years. The sole exception to this trend may be decoration type: false embroidery was used more often during the early and middle Holocene and overlay was used more often during the late Holocene. It is important to note that my sample of decorated specimens is small, and that false embroidery was often used by ethnographic Klamath and Modoc weavers. As such, it is possible that the diachronic difference that I observed may be a function of sample size.

A second exception is variation in vessel types between the NBC and the WBC. This is likely due to the large number of trays (*n*=10) from the NBC compared to the WBC (*n*=1). Again, this could be a product of the sample itself but if Catlow Twine appeared slightly later in the NBC, specifically during the middle Holocene, then this would correspond with the increased processing of small seeds during that time in the Great Basin and a concomitant increased need for seed processing technology (Rhode and Louderback 2007; Rhode et al. 2006). As I mentioned earlier, the Klamath and Modoc people used close simple twined with cordage warp trays for processing seeds.

Excluding these exceptions, which may simply be a function of my small sample, Catlow Twine basketry appears to have been manufactured in a consistent manner for over nine millennia in the northwestern Great Basin. It probably first appeared around Winnemucca Lake in northwestern Nevada. The first vessels manufactured using this type of simple twine technology were likely mats and possibly mat-based bags like the warp-faced plain weave mats and bags found at sites mostly in the WBC (except for Elephant Mountain and Cougar Mountain caves). The manufacturers of Catlow Twine basketry occupied sites in the WBC until ~4,000 cal B.P. when they likely began a movement further north and west into California during the middle Holocene. By the late Holocene, makers of Catlow Twine occupied sites throughout the northern Great Basin and people in the WBC likely acquired Catlow Twine through trade or exchange. The makers of Catlow are likely ancestral to the Klamath Modoc people who occupied the Klamath and Tule Lake regions during the ethnographic period.

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References Cited

Adovasio, James M.

1970 The Origin, Development, and Distribution of Western Archaic Textiles. *Tebiwa* 13(2):1-40.

1974 Prehistoric North American Basketry. In *Collected Papers on Aboriginal Basketry*, edited by Donald R. Tuohy and Doris L. Rendall, pp. 194-205. Nevada State Museum Anthropological Papers No. 16. Carson City.

1977 *Basketry Technology: A Guide to Identification and Analysis*. Aldine Publishing Company, Chicago.

1986a Prehistoric Basketry. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 194-205. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

1986b Artifacts and Ethnicity: Basketry as an Indicator of Territoriality and Population Movements in the Prehistoric Great Basin (with Rhonda L. Andrews). In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 43-89. University of Utah Anthropological Papers No. 110. Salt Lake City.

Adovasio, James M., and David R. Peddler

1994 A Tisket, a Tasket: Looking at the Numic Speakers through the "Lens" of a Basket. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by David B. Madsen and David Rhode, pp. 114-123. University of Utah Press, Salt Lake City.

Aikens, C. Melvin

1994 Adaptive Strategies and Environmental Change in the Great Basin and its Peripheries as Determinants in the Migrations of Numic-Speaking Peoples. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by David B. Madsen and David Rhode, pp. 35-43. University of Utah Press, Salt Lake City.

Aikens, C. Melvin, and Younger T. Witherspoon

1986 Great Basin Numic Prehistory: Linguistic, Archaeology, and Environment. In *Anthropology of the Desert West: Essays in the Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 7-20. University of Utah Press, Salt Lake City.

Andrews, Rhonda L., James M. Adovasio, and Ronald C. Carlisle

1986 *Perishable Industries from Dirty Shame Rockshelter, Malheur County, Oregon*. University of Oregon Anthropological Papers No. 34. Eugene.

Barker, James P., Eugene M. Hattori, Catherine S. Fowler, and William J. Cannon
2012 *Getting Beyond the Point: Paleoindian Textiles in the Northwestern Great Basin*. Paper Presented at the 33rd Biannual Great Basin Anthropological Conference, Stateline, Nevada.

Baumhoff, Martin A.
1957 *Catlow Twine from Central California*. Reports of the University of California Archaeological Survey Vol. 38. Berkeley.

1958 *Excavation of Cache Cave in Pershing County, Nevada*. University of California Archaeological Survey Reports Vol. 44. Berkeley.

Bedwell, Stephen F.
1973 *Fort Rock Basin: Prehistory and Environment*. University of Oregon Books, Eugene.

Bettinger, Robert L., and Martin A. Baumhoff
1982 The Numic Spread: Great Basin Cultures in Competition. *American Antiquity* 47(3):485-503

Connolly, Thomas J.
1994 Prehistoric Basketry from the Fort Rock Basin and Vicinity. In *Archaeological Researches in the Northern Great Basin: Fort Rock Archaeology since Cressman*, edited by C. Melvin Aikens and Dennis L. Jenkins, pp. 63-83. University of Oregon Anthropological Papers No. 50. Eugene.

2011 *Ancient Basketry in the Northern Great Basin: A 2011 Review and Prospectus*. Paper Presented at Fiber Perishable Chronologies in the Great Basin of Western North America. School for Advanced Research, Research Team Short Seminars, Santa Fe.

Connolly, Thomas J., Pat Barker, Catherine S. Fowler, Eugene M. Hattori, Dennis Jenkins, and William J. Cannon
2016 Getting Beyond the Point: Textiles of the Terminal Pleistocene/Early Holocene in the Northwestern Great Basin. *American Antiquity* 81(3):490-514.

Connolly, Thomas J., Catherine S. Fowler, and William J. Cannon
1998 Radiocarbon Evidence Relating to Northern Great Basin Basketry Chronology. *Journal of California and Great Basin Anthropology* 20(1):88-100.

Cowles, John
1959 *Cougar Mountain Cave in South Central Oregon.* Privately Printed, John Cowles, Ranier, Oregon.

Cressman, Luther S.
1936 *Archaeological Survey of the Guano Valley Region in Southeastern Oregon*. Studies in Anthropology, University of Oregon Monograph No. 1. Eugene.

1942 *Archaeological Research in the Northern Great Basin.* Carnegie Institute of Washington Publication No. 538. Washington, D.C.

1943 Results of Recent Research in the Northern Great Basin Region of South-Central Oregon. *Proceedings of the American Philosophical Society Symposium* 86(2):236-246.

1986 Prehistory of the Northern Area. In *Handbook of North American Indians* Vol. 11, *Great Basin*, edited by Warren d'Azevedo, pp. 120-126. Smithsonian Institution, Washington, D.C.

Fagan, John L.
1974 *Altithermal Occupation of Spring Sites in the Northern Great Basin.* University of Oregon Anthropological Papers No. 6. Eugene.

Fowler, Catherine S., and Eugene M. Hattori
2007 *Defining Boundaries in the Prehistoric Western Great Basin: The Textile Evidence*. Paper Presented at the 72nd Annual Meeting of the Society for American Archaeology, Austin, Texas.

2011 Exploring Prehistoric Trade in Western Great Basin Textiles. In *Perspectives on Prehistoric Trade and Exchange in California and the Great Basin*, edited by Richard E. Hughes, pp. 201-220. University of Utah Press, Salt Lake City.

2012 Prehistoric Textile Trade and Exchange in the Western Great Basin; Outland Coiling and Catlow Twining. In *Meeting at the Margins: Prehistoric Cultural Interactions in the Intermountain West*, edited by David Rhode, pp. 92-102. University of Utah Press, Salt Lake City.

Fowler, Catherine S., Eugene M. Hattori, and Amy J. Dansie
2000 Ancient Matting from Spirit Cave, Nevada: Technical Implications. In *Beyond Cloth and Cordage, Archaeological Textile Research in the Americas*, edited by Penelope B. Drooker and Laurie D. Webster, pp. 119-139. University of Utah Press, Salt Lake City.

Gogel, John M.
1983 Klamath, Modoc, and Shasta Basketry. *American Indian Basketry* 10:3-16.

Grayson, Donald K.
2011 *The Great Basin: A Natural Prehistory*. University of California Press, Berkeley.

Hattori, Eugene M., and Catherine S. Fowler
2006 *Early Catlow Twining in the Western Great Basin*. Paper Presented at the 30th Biennial Great Basin Anthropological Conference, Las Vegas, Nevada.

Hattori, Eugene M., Thomas J. Connolly, Catherine S. Fowler, James P. Barker, and Anna J. Camp
2016 *Early Catlow Twining in the Western Great Basin*. Paper Presented at the 35th Biennial Great Basin Anthropological Conference, Reno, Nevada.

Heizer, Robert F.
1942 Massacre Lake Cave, Tule Lake Cave, and Shore Sites. In *Archaeological Research in the Northern Great Basin*, edited by Luther S. Cressman, pp. 121-134. Carnegie Institution of Washington Publication No. 538. Washington, D.C.

Heizer, Robert F., and Alex Krieger
1956 The Archaeology of Humboldt Cave, Churchill County, Nevada. *University of California Publications in American Archaeology and Ethnology* 47(1)1-190.

Helzer, Margaret M.
2004 Archaeological Investigations of at the Bergen Site: Middle Holocene Lakeside Occupations near Fort Rock, Oregon. In *Early and Middle Holocene Archaeology of the Northern Great Basin*, edited by Dennis L. Jenkins, Thomas J. Connolly, and C. Melvin Aikens, pp. 77-94. University of Oregon Anthropological Papers No. 62. Eugene.

Jenkins, Dennis L., Michael S. Droz, and Thomas J. Connolly
2004 Geoarchaeology of Wetland Settings in the Fort Rock Basin, South-Central Oregon. In *Early and Middle Holocene Archaeology of the Northern Great Basin*, edited by Dennis L. Jenkins, Thomas J. Connolly, and C. Melvin Aikens, pp. 31-52. University of Oregon Anthropological Papers No. 62. Eugene.

Kaestle, Federika A., and David G. Smith
2001 Ancient Mitochondrial DNA Evidence for Prehistoric Population Movement: The Numic Expansion. *American Journal of Physical Anthropology* 115:1-12.

Kallenback, Elizabeth
2013 Chewaucan Cave Cache: A Specialized Tool Kit from Eastern Oregon. *Journal of California and Great Basin Anthropology* 33(1):72-87.

Lamb, Sydney
1958 Linguistic Prehistory in the Great Basin. *International Journal of American Linguistics* 24(2):95-100.

Loud, Llewellyn L., and Mark R. Harrington
1929 *Lovelock Cave*. University of California Publications in American Archaeology and Ethnology No. 25. Berkeley.

Louderback, Lisbeth A., Donald K. Grayson, and Marcos Llobera
2010 Middle Holocene Climates and Human Population Densities in the Great Basin, Western USA. *The Holocene* 21(2):366-373.

Madsen, David B., and David Rhode (editors)
1994 *Across the West: Human Population Movement and the Expansion of the Numa*. University of Utah Press, Salt Lake City.

Minar, C. Jill
2000 Spinning and Plying: Anthropological Directions. In *Beyond Cloth and Cordage: Archaeological Textile Research in the Americas*, edited by Penelope B. Drooker and Laurie D. Webster, pp. 85-99. University of Utah Press, Salt Lake City.

2001a Motor Skills and the Learning Process: The Conservation of Cordage Final Twist Direction in Communities of Practice. *Journal of Anthropological Research* 54:381-405.

2001b Material Culture and the Identification of Prehistoric Cultural Groups. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 94-113. Occasional Paper No. 28, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

O’Connell, James F.
1975 *The Prehistory of Surprise Valley*. Ballena Press Anthropological Papers 4, Banning, California.

Ollivier, Aaron P.
2016 *Evaluating Gaps in the Radiocarbon Sequences of Northwestern Great Basin Sandals*. Unpublished Master's Thesis, Department of Anthropology, University of Nevada, Reno.

Peck, Stuart L.
1950 A Fragment of Northern California Basketry from Southern California. *American Antiquity* 16:70.

Petersen, James B., Michael J. Heckenberger, and Jack A. Wolford
2001 Spin, Twist, and Twine: An Ethnoarchaeological Examination of Group Identity in Native Fiber Industries from Greater Amazonia. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 94-113. Occasional Paper No. 28, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Rhode, David, and P. Jeffrey Brantingham, Charles Perreault, and David B. Madsen
2014 Mind the Gaps: Testing for Hiatuses in Regional Radiocarbon Date Sequences. *Journal of Archaeological Science* 52:567-577.

Rhode, David, and Lisbeth Louderback
2007 Dietary Plant Use in the Bonneville Basin During the Terminal Pleistocene/Early Holocene Transition. In *Paleoindian or Paleoarchaic: Great Basin Human Ecology at the Pleistocene-Holocene Transition,* edited by Kelly E. Graf and Dave N. Schmitt, pp. 231-247. University of Utah Press, Salt Lake City.

Rhode, David, and David B. Madsen, and Kevin T. Jones
2006 Antiquity of Early Holocene Small-seed Consumption and Processing at Danger Cave. *Antiquity* 80:328-339.

Rozaire, Charles E.
1969 The Chronology of Woven Materials from Seven Caves at Falcon Hill, Washoe County, Nevada. In *Miscellaneous Papers on Nevada Archaeology,* edited by Doris L. Rendall and Donald. R. Tuohy, pp. 181-186. Nevada State Museum Anthropological Papers No. 16. Carson City.

1974 Analysis of Woven Materials from Seven Caves in Lake Winnemucca Area, Pershing County, Nevada. In *Collected Papers on Aboriginal Basketry,* edited by Donald R. Tuohy and Doris L. Rendall, pp.60-97. Nevada State Museum Anthropological Papers No. 16. Carson City.

Shanks, Ralph
2015 *Indian Baskets of Northern California and Oregon*. University of Washington Press, Seattle.

Smith, Geoffrey M.
2011 Shifting Stones and Changing Homes: Using Toolstone Ratios to Consider Relative Occupation Span in the Northwestern Great Basin. *Journal of Archaeological Science* 38:461-469.

Sutton, Mark Q.
1986 Warfare and Expansion: An Ethnohistoric Perspective on the Numic Spread. *Journal of California and Great Basin Anthropology* 8(1):65-82.

1993 The Numic Expansion in Great Basin Oral Tradition. *Journal of California and Great Basin Anthropology* 15(1):111-128.

Tuohy, Donald R., and Amy J. Dansie
1997 New Information Regarding Early Holocene Manifestations in the Western Great Basin. *Nevada Historical Society Quarterly* 40:24-53.

Tuohy, Donald R., and Eugene M. Hattori
1996 Lovelock Wickerware in the Lower Truckee River Basin. *Journal of California and Great Basin Anthropology* 18(2):284-296.

Weltfish, Gene
1930 *Coiled Gambling Baskets of the Pawnee and other Plains Tribes*. Museum of the American Indian, Heye Foundation Indian Notes, Vol. 7 No. 3, pp. 277-295, New York.

1932 Problems in the Study of Ancient and Modern Basket Makers. *American Anthropologist* 33:100-117.

Table 3.1. Catlow Twine specimens included in this study.

SPECIMEN NUMBER	VESSEL TYPE	SITE NAME	SITE NUMBER
Northern Basketry Center (NBC)			
1-3508	Base	Catlow Cave 1	35-HA-405
1-3475	Base	Catlow Cave 1	35-HA-405
1-3024	Base	Catlow Cave 1	35-HA-405
1-3152	Wall Fragment – Large	Catlow Cave 1	35-HA-405
1-3662A-B	Wall Fragment	Catlow Cave 1	35-HA-405
1-31272	Storage Basket	Chewaucan Cave	35-LK-3039
1-31273	Tray	Chewaucan Cave	35-LK-3039
15-C-12-15	Tray	Connley Cave 1	35-LK-50
1265-15-D-12-15	Tray	Connley Cave 5	35-LK-50
C3 3/1 C1	Wall Fragment	Dirty Shame Rockshelter	35-ML-65
WDM-106	Burden Basket	Elephant Mountain Cave	26-HU-3557
WDM-105	Burden Basket	Elephant Mountain Cave	26-HU-3557
751	Wall Fragment	Elephant Mountain Cave	26-HU-3557
WDM-4	Warp Fragment	Elephant Mountain Cave	26-HU-3557
1-9661	Tray	Fort Rock Cave	35-LK-1
1-14707	Wall Fragment	Fort Rock Cave	35-LK-1
1-14705	Wall Fragment	Fort Rock Cave	35-LK-1
1-14721	Wall Fragment	Fort Rock Cave	35-LK-1
1-34155	Mat	Fort Rock Cave	35-LK-1
1-34174	Mat	Fort Rock Crater Cave	35-LK-3125
1-34151	Mat	Fort Rock Crater Cave	35-LK-3125
1-34177	Wall Fragment – Large	Fort Rock Crater Cave	35-LK-3125
1-1237A	Mat	Lake Abert Cave 2	35-LK-1407
31-3910	Wall Fragment – Large	Last Supper Cave	26-HU-102
31-0979	Wall Fragment – Large	Last Supper Cave	26-HU-102
31-2202	Selvage Fragment	Last Supper Cave	26-HU-102
31-3753	Tray	Last Supper Cave	26-HU-102
NSM-1200A	Wall Fragment	Last Supper Cave	26-HU-102
NSM-1200B	Wall Fragment	Last Supper Cave	26-HU-102
31-2808	Wall Fragment	Last Supper Cave	26-HU-102
31-5229	Wall Fragment	Last Supper Cave	26-HU-102
31-5062	Wall Fragment	Last Supper Cave	26-HU-102

SPECIMEN NUMBER	VESSEL TYPE	SITE NAME	SITE NUMBER
31-238	Wall Fragment	Last Supper Cave	26-HU-102
31-2807	Wall Fragment	Last Supper Cave	26-HU-102
31-5063	Wall Fragment	Last Supper Cave	26-HU-102
31-245	Wall Fragment	Last Supper Cave	26-HU-102
31-4054	Wall Fragment	Last Supper Cave	26-HU-102
31-5408	Wall Fragment	Last Supper Cave	26-HU-102
FS-1293	Wall Fragment	LSP-1	35-HA-3735
FS-426	Wall Fragment	LSP-1	35-HA-3735
Z-1	Bowl	Massacre Lake Cave	26-WA-9
NCAT-5	Tray	Massacre Lake Cave	26-WA-9
120	Wall Fragment	Massacre Lake Cave	26-WA-538
1-5345	Wall Fragment	Paisley Cave 1	35-LK-3400
1-5344	Wall Fragment	Paisley Cave 1	35-LK-3400
94-12-2084	Wall Fragment	Peninsula Site	35-LK-2579
1-11981	Wall Fragment	Plush Cave	35-LK-49
1-12004	Wall Fragment	Plush Cave	35-LK-49
1-8625/1-8624B	Selvage Fragment	Roaring Springs Cave	35-HA-433
1-8710	Wall Fragment	Roaring Springs Cave	35-HA-433
1-8709	Tray	Roaring Springs Cave	35-HA-433
1-3714	Tray	Roaring Springs Cave	35-HA-433
1-8708/1-8914	Tray	Roaring Springs Cave	35-HA-433
1-8158	Wall Fragment	Roaring Springs Cave	35-HA-433
1-3722	Wall Fragment	Roaring Springs Cave	35-HA-433
1-8707	Wall Fragment	Roaring Springs Cave	35-HA-433
89-6-20	Wall Fragment	South Warner Cave	35-LK-94
89-6-18	Wall Fragment	South Warner Cave	35-LK-94
Western Basketry Center (WBC)			
905D	Basket	Chimney Cave	26-PE-3B
422	Warp Fragment	Crypt Cave	26-PE-3A
121.1	Weft Fragment	Crypt Cave	26-PE-3A
3988	Mat	Desiccation Cave	26-WA-291
52	Wall Fragment	Empire Cave	26-WA-197
321C	Mat	Fishbone Cave	26-PE-3E
306-1	Start/Patch	Fishbone Cave	26-PE-3E

SPECIMEN NUMBER	VESSEL TYPE	SITE NAME	SITE NUMBER
259-1A	Start/Patch	Guano Cave	26-PE-3D
451-5	Mat	Horse Cave	26-PE-2
1-43137	Wall Fragment	Humboldt Cave	NV-CH-35
1-43591	Wall Fragment	Humboldt Cave	NV-CH-35
1-43652	Wall Fragment	Humboldt Cave	NV-CH-35
1-43782	Wall Fragment	Humboldt Cave	NV-CH-35
1-44967	Wall Fragment	Humboldt Cave	NV-CH-35
1-45030	Wall Fragment	Humboldt Cave	NV-CH-35
1-45031	Wall Fragment	Humboldt Cave	NV-CH-35
1069/CER-45	Wall Fragment	Kramer Cave	26-WA-196
1069-2/1069-1b	Wall Fragment – Large	Kramer Cave	26-WA-196
1-20063	Wall Fragment	Lovelock Cave	NV-CH-18
2-41060	Wall Fragment	Lovelock Cave	NV-CH-18
2-41061	Mat	Lovelock Cave	NV-CH-18
1-20070	Tray	Lovelock Cave	NV-CH-18
1-20065	Wall Fragment	Lovelock Cave	NV-CH-18
26CH5-2014-3	Wall Fragment	Lovelock Cave	NV-CH-18
2-41070	Wall Fragment	Lovelock Cave	NV-CH-18
T-42	Wall Fragment	Nicolarsen Cave	26-WA-2488
524	Wall Fragment	Shinners A	26-WA-196
196a	Wall Fragment	Shinners A	26-WA-196
199	Warp Fragment	Shinners C	26-WA-200
17A	Warp Fragment	Wheeler Cave	26-CH-12

Table 3.2. Directly dated Catlow Twine specimens.

SPECIMEN NUMBER	VESSEL/SPECIMEN TYPE	SITE	SITE NUMBER	LAB NUMBER	DATE	μ	2σ CAL BP RANGE	PERIOD
1-5345	Wall Fragment	Paisley Cave 1	35-LK-3400	AA-19151	145±50	147	95.5-147	Contact Period
UNR 94-12-2084	Wall Fragment	Peninsula Site	35-LK-2579	AA-19784	240±65	254	Out of range	Contact Period
31-3753	Tray	Last Supper Cave	26-HU-102	D-AMS 018922	407±25	467	523-319	Late Holocene
1-12370b	Wall Fragment	Lake Abert Cave 2	35-LK-1407	AA-98331	615±35	603	659-545	Late Holocene
89-6-20	Wall Fragment	South Warner Cave	35-LK-94	AA-19787	660±135	643	917-467	Late Holocene
56-1-3024	Base – Start	Catlow Cave 1	35-HA-405	ICA-17P/0153	1010±30	923	1050-795	Late Holocene
89-6-18	Wall Fragment	South Warner Cave	35-LK-94	AA-19786	710±65	654	759-547	Late Holocene
404-IC3-3/1-C1	Wall Fragment	Dirty Shame	35-LM-65	ICA- 17P/0155	1110±30	1016	1174-931	Late Holocene
1-8710	Wall Fragment	Roaring Springs Cave	35-HA-433	Beta-249773	1110±40	1023	1173-932	Late Holocene
4	Warp Fragment	Elephant Mt Cave	26-HU-3557	AA-74055	1131±32	1039	1174-962	Late Holocene
FS-426	Wall Fragment	LSP-1	35-HA-3735	UGAMS-16860	1160±20	1084	1175-989	Late Holocene
306.1	Base – Patch	Fishbone Cave	26-PE-3E	AA-70980	1187±37	1115	1235-984	Late Holocene
FS-1293	Wall Fragment	LSP-1	35-HA-3735	UGAMS-16859	1200±20	1124	1800-1063	Late Holocene
120	Wall Fragment	Mule Ears Cave	26-WA-538	GAK-2809	1340±100	1245	1516-1003	Late Holocene
905d	Basket	Chimney Cave	26-PE-3D	Beta-250043	1400±40	1316	1408-1185	Late Holocene
52	Wall Fragment	Empire Cave	26-WA-197	AA-106412	1466±44	1363	1524-1286	Late Holocene
28	Wall Fragment	Empire Cave	26-WA-197	WSU-268	1480±155	1408	1732-1061	Late Holocene
31-0979	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018918	1524±45	1427	1551-1301	Late Holocene
31-238	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018916	1546±25	1455	1533-1351	Late Holocene
31-245	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018917	1550±29	1456	1543-1347	Late Holocene
31-3910	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018923	1669±41	1578	1712-1411	Late Holocene
31-5408	Wall Fragment	Last Supper Cave	26-HU-102	UCR-3922	1730±40	1642	1730-1545	Late Holocene
31-5062	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018925	1765±31	1675	1818-1564	Late Holocene
56-1-3152	Wall Fragment	Catlow Cave 1	35-HA-405	AA-106451	1851±31	1745	1833-1789	Late Holocene
31-2808	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018921	1826±38	1761	1888-1610	Late Holocene
31-2202	Selvage Fragment	Last Supper Cave	26-HU-102	D-AMS 018919	1861±41	1795	1934-1621	Late Holocene

SPECIMEN NUMBER	VESSEL/SPECIMEN TYPE	SITE	SITE NUMBER	LAB NUMBER	DATE	μ	2σ CAL BP RANGE	PERIOD
31-4054	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018924	1892±33	1832	1945-1711	Late Holocene
31-2807	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018920	1948±33	1898	2001-1740	Late Holocene
3988	Mat	Desiccation Cave	26-WA-291	GAK-2804	1950±100	1905	2150-1625	Late Holocene
31-5063	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018926	1964±33	1916	2041-1816	Late Holocene
31-5229	Wall Fragment	Last Supper Cave	26-HU-102	D-AMS 018927	2024±26	1973	1884-2113	Late Holocene
WDM-105	Burden Basket	Elephant Mt Cave	26-HU-3557	Beta-83488	2030±60	1999	2147-1868	Late Holocene
WDM-106	Burden Basket	Elephant Mt Cave	26-HU-3557	Beta-83487	2060±60	2036	2295-1882	Late Holocene
60-1-8158	Bowl	Massacre Lake Cave	26-WA-9	Beta-239733	2070±40	2042	2299-1887	Late Holocene
56-1-3475	Start – Base	Catlow Cave 1	35-HA-405	ICA-17P/0154	2220±30	2231	2341-2127	Late Holocene
191	Wall Fragment	Roaring Springs Cave	35-HA-433	AA-106453	2253±29	2249	2349-2151	Late Holocene
1069-1	Warp Fragment	Shinners Site C	26-WA-200	AA-74068	3656±38	3986	4090-3873	Late Holocene
196A	Wall Fragment	Kramer Cave	26-WA-196	UCLA-905	3660±80	3996	4236-3728	Late Holocene
1-3722	Wall Fragment	Shinners Site A	26-WA-198	Beta-449383	3690±30	4030	4151-3897	Late Holocene
15-C-12-15	Wall Fragment	Roaring Springs Cave	35-HA-433	Beta-448981	3730±30	4074	4236-3929	Late Holocene
1-14707	Tray	Connley Cave 1	35-LK-50	Beta-164960	4240±50	4769	4951-4584	Late Holocene
100KC-14707	Wall Fragment	Fort Rock Cave	35-LK-1	AA-19150	4430±60	5068	5308-4849	Middle Holocene
575-1-34177	Wall Fragment	Fort Rock Crater Cave	35-LK-3125	AA-98327	4476±59	5127	5307-4887	Middle Holocene
1126515-D-12-15	Wall Fragment	Connley Cave 5	35-LK-50	Beta-164958	4590±50	5280	5465-5052	Middle Holocene
121.1	Weft Fragment	Crypt Cave	26-PE-3A	AA-74063	4965±40	5698	5874-5601	Middle Holocene
1-22-19	Warp Fragment	Wheeler Cave	17A 26-CH-12	AA-74058	5102±41	5831	5924-5745	Middle Holocene
422	Warp Fragment	Crypt Cave	26-PE-3A	AA-74064	6118±43	7018	7158-6895	Middle Holocene
1-5344	Wall Fragment	Nicolarsen Cave	26-WA-2488	Beta-137953	6360±30	7299	7416-7183	Middle Holocene
100B.P.-15344	Wall Fragment	Paisley Cave 1	35-LK-3400	AA-19153	6560±70	7465	7577-7325	Middle Holocene
259.1A	Base – Patch	Guano Cave	26-PE-3D	AA-11594	6765±65	7620	7730-7505	Middle Holocene
751	Wall Fragment	Elephant Mountain Cave	26-HU-3557	Beta-250049	7100±60	7920	8157-7715	Middle Holocene
524	Wall Fragment	Shinners Site A	26-WA-198	Beta-214527	8140±40	9088	9247-9001	Early Holocene
321	Mat	Horse Cave	26-PE-2	UCR-3965	8270±40	9263	9415-9127	Early Holocene
Z-1	Mat	Fishbone Cave	26-PE-3e	UCR-3779	8370±50	9385	9495-9267	Early Holocene

Table 3.3. Gaps with associated probabilities in the sample of dated Catlow Twine specimens from the northern (NBC) and western (WBC) Great Basin basketry centers (after Rhode et al. 2014).

VESSEL TYPE	**LAB NUMBER**	**SITE**	**DATE**	**GAP (τ)**	τ/β	$-e^{-\tau/\beta}$
Wall Fragment	AA-19151	Paisley Cave 1	145	95	-0.62371	0.536
Wall Fragment	AA-19784	Peninsula Site	240	167	-1.09641	0.3341
Tray	D-AMS 018922	Last Supper Cave	407	208	-1.36559	0.2552
Wall Fragment	AA-98331	Lake Abert Cave 2	615	45	-0.29544	0.7442
Wall Fragment	AA-19787	South Warner Cave	660	50	-0.32827	0.7202
Base – Start	ICA-17P/0153	Catlow Cave 1	710	300	-1.9696	0.1395
Wall Fragment	AA-19786	South Warner Cave	1010	100	-0.65653	0.5186
Wall Fragment	ICA- 17P/0155	Dirty Shame Rockshelter	1110	0	0	1.0000
Wall Fragment – Large	Beta-249773	Roaring Springs Cave	1110	21	-0.13787	0.8712
Warp Fragment	AA-74055	Elephant Mountain Cave	1131	29	-0.1904	0.8266
Wall Fragment	UGAMS-16860	Little Steamboat Point 1	1160	20	-0.13131	0.8769
Base – Patch	AA-70980	Fishbone Cave	1180	7	-0.04596	0.9551
Wall Fragment	UGAMS-16859	LSP-1	1187	13	-0.08535	0.9182
Wall Fragment	GAK-2809	Mule Ears Cave	1200	140	-0.91915	0.3989
Basket	Beta-250043	Chimney Cave	1340	60	-0.39392	0.6744
Wall Fragment	AA-106412	Empire Cave	1400	66	-0.43331	0.6484
Wall Fragment	WSU-268	Empire Cave	1466	14	-0.09191	0.9122
Wall Fragment – Large	D-AMS 018918	Last Supper Cave	1480	44	-0.28888	0.7491
Wall Fragment	D-AMS 018916	Last Supper Cave	1524	22	-0.14444	0.8655
Wall Fragment	D-AMS 018917	Last Supper Cave	1546	4	-0.02626	0.9741
Wall Fragment – Large	D-AMS 018923	Last Supper Cave	1550	119	-0.78128	0.4578
Wall Fragment	UCR-3922	Last Supper Cave	1669	61	-0.40049	0.6700
Wall Fragment	D-AMS 018925	Last Supper Cave	1730	35	-0.22979	0.7947
Wall Fragment – Large	AA-106451	Catlow Cave 1	1765	61	-0.40049	0.6700
Wall – Fragment	D-AMS 018921	Last Supper Cave	1826	25	-0.16413	0.8486
Selvage Fragment	D-AMS 018919	Last Supper Cave	1851	10	-0.06565	0.9365

VESSEL TYPE	LAB NUMBER	SITE	DATE	GAP (τ)	τ/β	$-e^{-\tau/\beta}$
Wall Fragment	D-AMS 018924	Last Supper Cave	1892	56	-0.36766	0.6924
Wall Fragment	D-AMS 018920	Last Supper Cave	1948	2	-0.01313	0.9870
Mat	GAK-2804	Desiccation Cave	1950	14	-0.09191	0.9122
Wall Fragment	D-AMS 018926	Last Supper Cave	1964	60	-0.39392	0.6744
Wall Fragment	D-AMS 018927	Last Supper Cave	2024	6	-0.03939	0.9614
Burden Basket	Beta-83488	Elephant Mountain Cave	2030	30	-0.19696	0.8212
Burden Basket	Beta-83487	Elephant Mountain Cave	2060	10	-0.06565	0.9365
Bowl	Beta-239733	Massacre Lake Cave	2070	150	-0.9848	0.3735
Start	ICA-17P/0154	Catlow Cave 1	2220	33	-0.21666	0.8052
Wall Fragment – Large	AA-106453	Roaring Springs Cave	2253	1403	-9.21119	0.0001
Warp Fragment	AA-74068	Shinners Site C	3656	4	-0.02626	0.9741
Wall Fragment – Large	UCLA-905	Kramer Cave	3660	30	-0.19696	0.8212
Wall Fragment – Large	Beta-449383	Shinners Site A	3690	40	-0.26261	0.7690
Wall Fragment – Large	Beta-448981	Roaring Springs Cave	3730	510	-3.34833	0.0351
Tray	Beta-164960	Connley Caves 1	4240	190	-1.24742	0.2872
Wall Fragment	AA-19150	Fort Rock Cave	4430	46	-0.30201	0.7393
Mat	AA-98327	Fort Rock Crater Cave	4476	114	-0.74845	0.4731
Wall Fragment	Beta-164958	Connley Cave 5	4590	375	-2.46201	0.0853
Weft Fragment	AA-74063	Crypt Cave	4965	137	-0.89945	0.4068
Warp Fragment	AA-74058	Wheeler Cave	5102	1016	-6.6704	0.0013
Warp Fragment	AA-74064	Crypt Cave 26Pe3a	6118	242	-1.58881	0.2042
Wall Fragment	Beta-137953	Nicolarsen Cave	6360	200	-1.31307	0.2690
Wall Fragment	AA-19153	Paisley Cave 1	6560	205	-1.3459	0.2603
Base – Patch	AA-11594	Guano Cave	6765	335	-2.19939	0.1109
Wall Fragment	Beta-250049	Elephant Mountain Cave	7100	1040	-6.82796	0.0011
Wall Fragment	Beta-214527	Shinners Site A	8140	130	-0.8535	0.4259
Mat	UCR-3965	Horse Cave	8270	100	-0.65653	0.5186
Mat	UCR-3779	Fishbone Cave	8370			

Table 3.4. Gaps with associated probabilities in the sample of early (before 2253 ^{14}C) Catlow Twine specimens from the northern (NBC) and western (WBC) Great Basin basketry centers (after Rhode et al. 2014).

VESSEL TYPE	**LAB NUMBER**	**SITE**	**DATE**	**DATE**	**GAP (τ)**	τ/β	$-e^{-\tau/\beta}$
Warp Fragment	AA-74068	Shinners Site C	3656±38	3656	4	0.013577	0.9865
Wall Fragment	UCLA-905	Kramer Cave	3660±80	3660	30	0.101824	0.9032
Wall Fragment	Beta-449383	Shinners Site A	3690±30	3690	40	0.135766	0.8730
Wall Fragment	Beta-448981	Roaring Springs Cave	3730±30	3730	510	1.731014	0.1771
Tray	Beta-164960	Connley Cave 1	4240±50	4240	190	0.644888	0.5247
Wall Fragment	AA-19150	Fort Rock Cave	4430±60	4430	46	0.156131	0.8554
Mat	AA-98327	Fort Rock Crater Cave	4476±59	4476	114	0.386933	0.6791
Wall Fragment	Beta-164958	Connley Cave 5	4590±50	4590	375	1.272804	0.2800
Weft Fragment	AA-74063	Crypt Cave	4965±40	4965	137	0.464998	0.6281
Warp Fragment	AA-74058	Wheeler Cave	5102±41	5102	1016	3.448451	0.0318
Warp Fragment	AA-74064	Crypt Cave	6118±43	6118	442	1.500212	0.2231
Wall Fragment	AA-19153	Paisley Cave 1	6560±70	6560	205	0.6958	0.4987
Base – Patch	AA-11594	Guano Cave	6765±65	6765	335	1.137039	0.3208
Wall Fragment	Beta-250049	Elephant Mountain Cave	7100±60	7100	1040	3.529911	0.0293
Wall Fragment	Beta-214527	Shinners Site A	8140±40	8140	130	0.441239	0.6432
Mat	UCR-3965	Horse Cave	8270±40	8270	100	0.339415	0.7122
Mat	UCR-3779	Fishbone Cave	8370±50	8370		0.013577	0.9865

Table 3.5. Wall construction attributes of Catlow Twine basketry from the Northern (NBC) and Western (WBC) Great Basin basketry centers.

	TECHNOLOGICAL ATTRIBUTES					
BASKETRY CENTER	**Weft (Z-twist)**	**Warp (Z/ss)**	**Warp Insertion Type 1a**	**Absence of Warp Insertion**	**Weft Insertion Type 1a**	**Absence of Weft Insertion**
NBC	56 (63%)	56 (63%)	38 (43%)	18 (20%)	47 (52%)	9 (10%)
WBC	33 (37%)	33 (37%)	14 (16%)	19 (21%)	15 (18%)	18 (20%)
Total	**89 (100%)**	**89 (100%)**	**52 (59%)**	**37 (41%)**	**62 (70%)**	**27 (30%)**

Table 3.6. Middle and late Holocene start types.

	START TYPE	
SAMPLE	**Type 1A**	**Type 1B**
Middle Holocene	2	0
Late Holocene	5	2
Total	**7**	**2**

Fisher Exact Test: *p*=.580

Table 3.7. Start types between the northern (NBC) and the western (WBC) Great Basin basketry centers.

	START TYPE	
SAMPLE	**Type 1A**	**Type 1B**
NBC	6	2
WBC	2	0
Total	**8**	**2**

Fisher's Exact Test: *p*=.999

Table 3.8. Decoration types for middle and late Holocene Catlow Twine basketry.

	DECORATION TYPE		
SAMPLE	**S-Twist**	**Overlay**	**False Embroidery**
Middle Holocene	0	3	3
Late Holocene	1	26	2
Total	**1**	**29**	**5**

Fisher's Exact Test: *p*=.050

Table 3.9. Catlow Twine decoration types between the northern (NBC) and western (WBC) Great Basin basketry centers.

	DECORATION TYPE			
SAMPLE	**S-Twist**	**Overlay**	**False Embroidery**	**Triple Weft**
NBC	0	35	8	0
WBC	1	15	2	2
Total	**1**	**50**	**10**	**2**

Fisher’s Exact Test: *p*=.068

Table 3.10. Decoration designs on middle and late Holocene Catlow Twine basketry.

	DECORATION DESIGN			
SAMPLE	**Checkering**	**Concentric Circles**	**Triangles, Rectangles, and Squares**	**Lines/ Bands**
Middle Holocene	0	1	0	1
Late Holocene	0	0	2	0
Total	**0**	**1**	**2**	**1**

Fisher's Exact Test *p*=.070

Table 3.11. Decoration designs on Catlow Twine basketry from the northern (NBC) and western (WBC) Great Basin basketry centers.

	DECORATION DESIGN			
SAMP LE	**Checkering**	**Concentric Circles**	**Triangles, Rectangles, and Squares**	**Line and Bands**
NBC	4	10	6	11
WBC	6	1	4	3
Total	**10**	**11**	**10**	**14**

Fisher's Exact Test: *p*=.070

Table 3.12. Middle and late Holocene Catlow Twine vessel types.

	VESSEL TYPE			
SAMPLE	**Mat**	**Tray**	**Burden Baskets**	**Bowl/Container**
Early/Middle Holocene	3	0	0	2
Late Holocene	1	3	2	5
Total	**4**	**3**	**2**	**7**

Fisher's Exact Test: *p*=.190

Table 3.13. Catlow Twine vessel types between the northern (NBC) and the western (WBC) Great Basin basketry centers.

SAMPLE	**VESSEL TYPE**			
	Mat	**Tray**	**Burden Baskets**	**Bowl/Container**
NBC	4	10	2	4
WBC	6	1	0	4
Total	**10**	**11**	**2**	**8**

Fisher's Exact Test: *p*=.045

Figure 3.1. Catlow Twine basketry from Connley Cave 1 (artifact number 1-9085, from the University of Oregon NCHM).

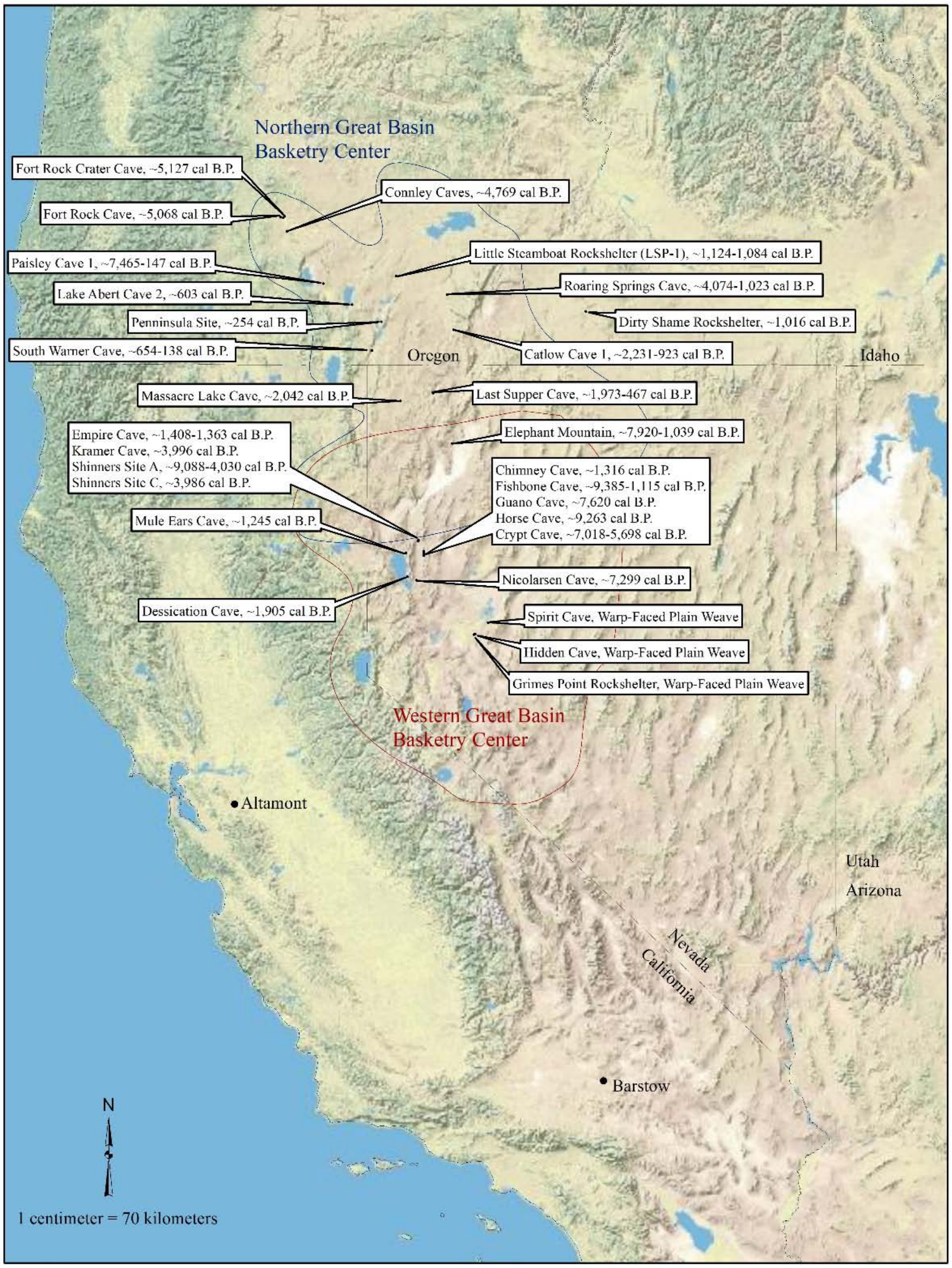

Figure 3.2. Map of the northern (NBC) and western (WBC) Great Basin basketry centers and sites with earliest and latest dates for Catlow Twine basketry.

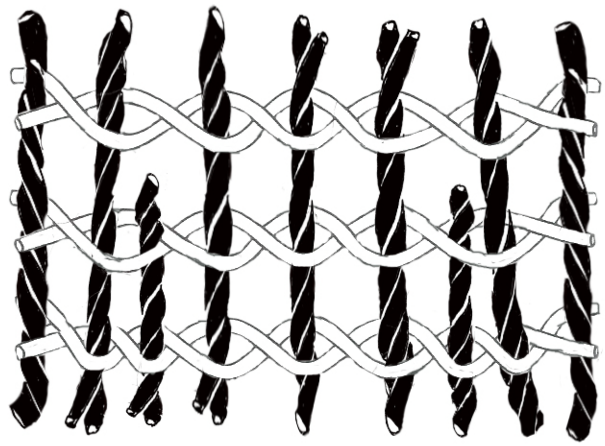

Figure 3.3. Warp insertion (splicing) Type 1a for simple close twine basketry (image adapted from Adovasio 1970a).

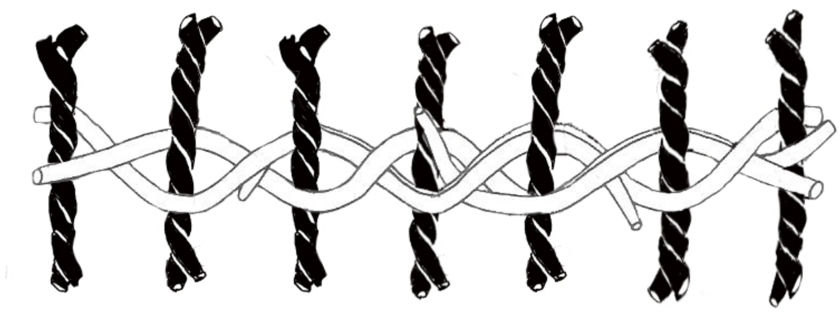

Figure 3.4. Weft insertion (splicing) Type 1d for simple close twine basketry (image drawn by Abigail Stockinger and adapted from Adovasio 1970a).

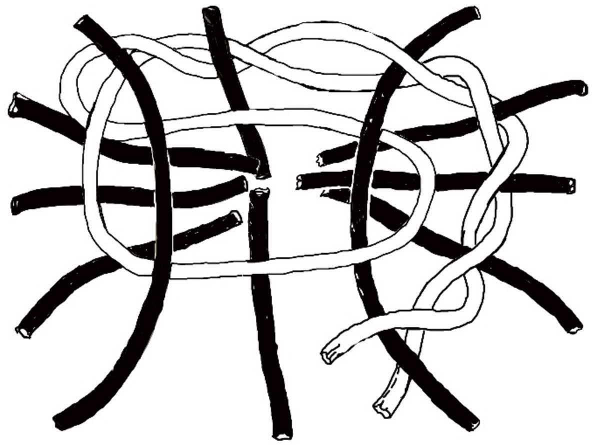

Figure 3.5. Start Type 1a seen in sample of undecorated Catlow Twine basketry from the NBC (cordage warp not shown) (image adapted from Cressman 1942).

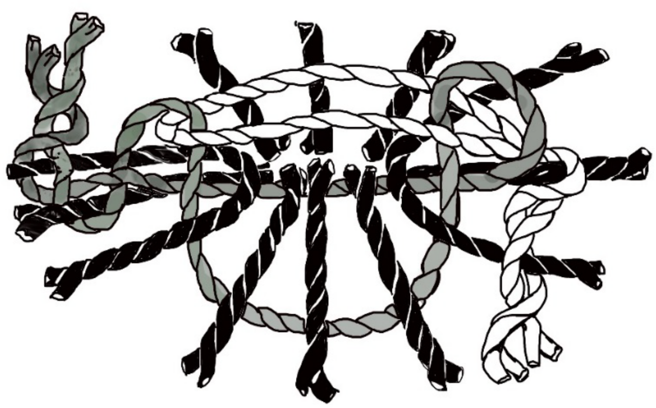

Figure 3.6. Start Type 1b seen in sample of undecorated Catlow Twine basketry from the NBC (image drawn by Abigail Stockinger and adapted from Cressman 1942).

Notes

1. AA-86298, 131±35 (not previously reported). Radiocarbon dates calibrated to 2σ with OxCal v.4.2 online radiocarbon program using IntCal 09 curve.

Chapter 4:

COMPARING CATLOW TWINE AND KLAMATH-MODOC BASKETRY: TECHNOLOGICAL AND STYLISTIC ATTRIBUTES AND THEIR REFLECTION OF GROUP IDENTITY

Catlow Twine basketry spans over 9,000 years in the northwestern Great Basin. Many researchers have noted that it shares technological affinities with ethnographic Klamath-Modoc basketry, thereby connecting prehistoric and ethnographic cultures; however, this hypothesis has remained untested. In this paper, I compare quantitative and qualitative data on technological and stylistic attributes of archaeological Catlow Twine and ethnographic Klamath-Modoc basketry from the northwestern Great Basin to evaluate the possibility that the two samples reflect over 9,000 years of cultural continuity in the region. My results reveal that while there are some similarities between Catlow Twine and Klamath-Modoc basketry, there are also significant differences. Changes in production technique and style between ethnographic Klamath/Modoc and archaeological Catlow Twine basketry occurred around the time of Euro-American contact when basket makers began to express their identity in subtle ways. Some changes may be attributed to Yahooskin Paiute production of some "Klamath-Modoc" baskets, while other changes are likely due to the production of basketry for sale during the arts and crafts period.

Introduction

Basketry is described by many researchers (Adovasio 1970, 1974, 1986a, 1986b; Adovasio and Peddler 1994; Connolly and Barker 2004; Fowler and Hattori 2007; Hattori and Fowler 2006) as one of the most sensitive cultural and temporal markers of prehistoric populations in the Great Basin. Diachronic change in prehistoric basketry is generally gradual (d'Azevedo 1986; Grayson 2011) but when shifts are abrupt it may signal population change through immigration and acculturation or other major sociocultural or environmental factors (Adovasio 1977; Adovasio and Peddler 1994). Catlow Twine, a basketry type found at numerous sites in the northwestern Great Basin, exhibits at least superficial technological continuity throughout much of the Holocene (Connolly et al. 1998; Fowler and Hattori 2007, 2011, 2012; Hattori and Fowler 2006). Furthermore, some researchers (e.g., Cressman 1942, 1986; Fowler and Hattori 2011, 2012) argue that Catlow Twine basketry is similar and possibly ancestral to ethnographic Klamath and Modoc basketry (Connolly 1994; Shanks 2015). Long ago, Luther Cressman (1943:241), who first described Catlow Twine basketry, stated that "unless we have pieces with the rim or bottom it is impossible to distinguish fragmentary pieces of modern Klamath-Modoc ware from Catlow Twine". If this assertion is correct, then one implication is that Catlow Twine remained unchanged for over 9,000 years. A second implication is that ethnographic and prehistoric basketry are strongly connected, which may indicate considerable time depth for native groups living in the region today. In this paper, I test the hypothesis that archaeological Catlow Twine and ethnographic Klamath-Modoc basketry are technologically indistinguishable by comparing nominal data collected on various technological and stylistic attributes.

Basketry Technology and Identity

Basketry (e.g., mats, bowls, trays, bags, hats, sandals, etc.) can reveal cultural information (Adovasio 1970, 1977, 1986; Andrews et al. 1986; King 1975; Mason 1904; Rozaire 1969; Weltfish 1930, 1932). This is because weavers' manufacturing choices are seen in the final product and those choices are culturally driven (Adovasio and Peddler

1994). Adovasio and Peddler (1994:116) argue that no other artifact class has so many attributes that are considered "culturally bound". The fixed number of logical alternatives and possible combinations offer researchers insight into both cultural affiliation (Adovasio 1970, 1974, 1977; Adovasio and Peddler 1994) and cultural frontiers (Adovasio 1970, 1986a), the latter of which may be identified by determining where basketry types begin and end in both space and time. Such recognitions are made by taxonomically analyzing basketry assemblages, which involves assigning specimens to subclasses of weaves (e.g., twining, coiling, plaiting) and then to technological types, which are based on the number of shared attributes. This approach increases taxonomic resolution, allowing analysts to identify attributes that signify both group and individual manufacturing choices (Adovasio and Peddler 1994; Jolie 2014; Petersen et al. 2001).

Within the context of basketry analysis, researchers typically focus on a few attributes. *Twining* is characterized by turning or passing groups of two or more active horizontal elements of the same set (weft elements) to enclose successive passive vertical elements of the opposite set (warp elements) (Figure 4.1). *Pairing* refers to the pairing of wefts. *Cording* is associated mostly with the warp and involves *twisting* two or more elements about each other. In twining, the terms *close* or *open* refer to the space used in setting distance between successive rows or courses of twining elements (Adovasio 1970, 1977; Connolly 1994; Emery 1966). *Spinning* is the process of making cordage by rotating together and drawing out combined short fibers into a continuous strand (ply), and then combining two or more strands by *twisting* them together to make the final cord (Emery 1966). Finally, *directionality* refers to both the direction of the twist and spin, which is either S (clockwise) or Z (counterclockwise), and the direction in which the weaver is moving towards when twining, which is in either a clockwise (rightward) or counterclockwise (leftward) motion. For example, Klamath-Modoc basketry is manufactured by the weaver moving in a counterclockwise motion, and the two-ply weft strand is twisted down-to-the-right (i.e., Z-twist). Using this motion is an effective way for the weaver to manufacture a firm basket, by "pressing down on the preceding weft" (Cressman 1942:35). A clockwise direction is when the weaver moves the weft down-to-the-left (S-twist), which is the preferred direction used by the neighboring Northern Paiute. A Z-twist weft paired with the clockwise work direction produces a firm and tightly woven basket (Cressman 1942; Shanks 2015).

It is important to understand the manufacturing decisions made in twined basketry because each attribute provides subtle but important information about group affiliation (Petersen et al. 2001). For example, directionality may be a useful identity marker (Adovasio 1970; Cressman 1942; Fowler and Hattori 2012; Minar 1999, 2001a, 2001b; Petersen et al. 2001; Rozaire 1969). Discrete attributes such as spin and twist in cordage, as well as weft slant in twined structures, reflect differences in the weaving technologies across ethnographic tribes and language families in North and South America (Adovasio and Peddler 1994; Minar 1999, 2001a, 2001b; Petersen et al. 2001).

Ethnographic information adds to our understanding of choices in directionality and its importance to indigenous groups. Using ethnographic data from North America, Peru, Korea, and Columbia, Minar (2001a, 2001b) argues that directionality reflects both symbolic and religious beliefs. The symbolic meaning is when one object or shape represents something else and that meaning is understood by the participating culture. In contrast, religious meaning reflects a group's belief in how they see the world and their insights into a supernatural power (Guest 2016). In North America, the Navajo believe that a mythological character called Spider Woman gave specific instructions to Chief Medicine Woman to spin in a direction that moved toward the body to ensure that the basket maker would receive goods. Furthermore, the Navajo believe that these goods could disappear if the directionality rule is not upheld (Thomas 1996). In Peru, when threads are spun in the opposite direction from what is culturally prescribed, the basket maker may be suspected of using sorcery to combat black magic or improve economy and health (Buechler and Buechler 1971; Minar 2001b). In South Korea, a belt used as part of a mourning costume is sometimes spun in the reverse direction from what is considered normal (Knez 1960). Finally, Kogi men and women of the Columbian Amazon learn to weave in opposite directions, demonstrating how patterns are strongly influenced by interactions between teachers and their students (Minar 2000).

Petersen et al.'s (2001) analysis of woven materials from the Amazon examined how attributes such as spin, twist, and twining weft slant often correlate with specific social groups. He demonstrated how manufacturing choices show iconological, emblematic, and technological style in what researchers describe as learning networks and communities of practice (Jolie 2014; Lave and Wenger 1991; Minar and Crown 2001; Van Hoose 2000, 2004; Van Hoose and Schleher 2002). Using ethnographic and archaeological evidence, Petersen et al. (2001) determined that general patterns can be derived from Amazonian fiber industries, which can provide useful information about cultural boundaries. For example, preference for either Z- or S-twist in both cordage weft slant of twined basketry made by Amazonian people is thought to be correlated with language groups. Petersen et al. (2001) found that the Yanomamo and the Xinguanos would be recognizable in the archaeological record based on their preference of twist and spin. The upper Xingu (Xinguanos speakers) prefer the S-twist when manufacturing cordage and S-twist weft slant, while the preference of neighboring groups are Z-twist wefts. Fowler and Hattori (2007) point out that while choices for weaving options are incalculable, attributes of archaeological specimen's cluster remarkably well and culture often guides methods of manufacturing and the end-product of Great Basin weavers. This clustering makes textile typological analysis possible.

Catlow Twine Basketry

Cressman (1942) first described Catlow Twine basketry as a simple close twined basketry on a two-ply twisted warp, with the weft twist down-to-the-right (i.e., Z-twist weft) (Figure 4.2). Catlow Twine basketry is manufactured with marsh reeds, primarily tule (*Schoenoplectus acutus*), and is semi-flexible, intermediate between the rigid simple close twined baskets made by California's Pit River tribes and the soft simple close twined bags and baskets made by tribes on the Columbia Plateau (Cressman 1942). Cressman (1942) based his definition of Catlow Twine on several technological and structural features, which include: (1) starting technique; (2) warp splicing (i.e., method of insertion of new warps); (3) weft twist (i.e., pitch of stitch); (4) selvage type (i.e., rim finish); (5) firmness of weave; and (6) decoration types (e.g., overlay, false embroidery, three strand twining). These structural and stylistic features distinguish Catlow Twine from other archaeological basketry technologies and have long allowed archaeologists to recognize its presence in assemblages (Baumhoff 1957; Bedwell 1973; Cressman 1942;

Eiselt 1997; Hattori 1982; Heizer 1942; Heizer and Krieger 1956; Rozaire 1969; Smith et al. 2016).

One of the most defining attributes of Catlow Twine basketry is the tule cordage warp, which was initially recognized by Cressman (1936, 1942, 1943) and later discussed by Fowler and Hattori (2011, 2012) as being two spun tule plies which are then twisted together. The initial rotation of the flat split strips is S-spun (i.e., spun in a clockwise motion) and then the two plies are twisted together in a counter clockwise motion (i.e., Z-twist), which produces two-ply S-spun, Z-twist cordage represented as Z/ss (Figure 4.3). Cressman (1942) noted that the ethnographic Klamath-Modoc used the same cordage warp type as seen in archaeological Catlow Twine. Warp splicing (i.e., method of insertion of new warps), as described by Cressman (1942, 1943), is done by adding the warp into the twining stitch at a chosen place. The remaining projecting end is trimmed flush once the basket is finished. Cressman (1942) also noted a second type of Catlow Twine warp insertion on a basket from Humboldt Cave, Nevada. In this type of splicing, the weaver inserts the warp by looping at the point of insertion. A similar type of warp insertion occurs in Basketmaker assemblages from the American Southwest (Cressman 1942) but there are no known examples of this type of warp insertion that have been noted from ethnographic basketry in the Great Basin.

Other attributes including start, selvage, and decoration types help to define Catlow Twine basketry. Cressman (1942, 1943) described Catlow Twine as having three start types, all of which are based on the same general technique: (1) two warps placed parallel to each other loop back to form four warps and then the loop of the weft encircles the warps, pulling them together and the twining begins (Figure 4.4a); (2) additional warps are pushed firmly into the center and held in place by the twining (Figure 4.4b); and (3) five warps running across the bottom – the first one passes through the middle, the other four curve back, and then six warps are added (Figure 4.4c) (Cressman 1942:35). All three start types are structurally similar. They are circular in shape; very fine; and splicing is initiated early in the weaving process. In this study, I combine these three variations into one category (referred to as Start Type 1) (see Figure 4.4 a). Cressman (1942) described Klamath-Modoc start types as having some differences from Catlow Twine, the main one being that the weaver bundles the warps in the start and subdivides them into smaller bundles as they move out from the start. Cressman (1942) described this method of starting a basket as seen in Basketmaker I and II assemblages, the soft bags of the Columbia Plateau, and some straight-sided bags of the Tlingit. He suggested that while these types have some differences, the similarities of certain traits seen in the baskets of the Oregon caves, Basketmaker I and II sites, ethnographic Klamath-Modoc, and Plateau "are too close to be accidental" (Cressman 1942:43).

Structural attributes outside of the wall construction and starts includes selvage and decoration types. Cressman (1942) described the typical Catlow Twine selvage type (i.e., rim finish) as being trimmed flush with the last twined course (Figure 4.5). He also recognized a second type of selvage in specimens from Catlow Cave 1, Oregon, made by bending the warps over and down between the adjacent top weft stitch along the warp on the inside of the basket (Figure 4.6) (Cressman 1942). Decoration types found on Catlow Twine basketry include: (1) one or two strands of plain twine overlay (Figure 4.7a); (2) wrapped twine overlay (Figure 4.7b); (3) false embroidery (Figure 4.7c); (4) dyes; and (5) various combinations of these techniques (Cressman 1942).

In sum, Catlow Twine is defined by specific attributes such as the weft slant (Z-twist), the cordage warp (S-Spun Z-twist), warp splicing (simple insertion between preexisting weft crossings), start type (warps laid parallel and early onset of splicing), selvage type (truncated warps visible at the final weft row), and decoration types (overlay, wrapped twine overlay, false embroidery, and dyed wefts). Ethnographic basketry produced by Klamath-Modoc people in south-central Oregon and northeastern California possesses similarities in construction (e.g., weft slant, weft insertion, cordage warp, twined overlay) which, at face value, suggest some relationship between archaeological and ethnographic cultures (Cressman 1942; Fowler and Hattori 2007, 2011, 2012; Hattori and Fowler 2006; Shanks 2015), In the remainder of this paper, I evaluate that possibility.

Material and Methods

To test the hypothesis that Catlow Twine basketry from archaeological contexts is technologically consistent with ethnographic Klamath-Modoc basketry, I examined collections housed at the Nevada State Museum (NSM), the University of Oregon's Museum of Natural and Cultural History (MNCH), and the Phoebe A. Hurst Museum of Anthropology at the University of California, Berkeley (PHMA). The archaeological Catlow Twine basketry in these collections was recovered from sites in northwestern Nevada, northern California, and southeastern Oregon that contained significant amounts of Catlow Twine. I analyzed 69 archaeological Catlow Twine artifacts from those sites (Table 4.1). I analyzed 54 ethnographic Klamath-Modoc baskets (Table 4.2). Most of the ethnographic baskets from the PHMA were collected from the Klamath Reservation as part of the Ethnological and Archaeological Survey of California (Barrett 1910). The ethnographic baskets from the MNCH were primarily purchased from the Klamath Reservation by basketry collectors and donated to the museum.

I focused my analysis of the ethnographic and archaeological collections on pitch of stitch (i.e., weft twist), warp insertion (i.e., splicing), and warp spin and twist. I also recorded start, selvage, and decoration types. Because I sought to compare as many aspects of archaeological and ethnographic basketry as possible, I selected archaeological and ethnographic specimens that contained information related to wall construction and at least one additional attribute such as start, selvage, or decoration type.

First, I recorded data for each basket using a standardized form adapted from Adovasio (1977). In most cases, those attributes that Cressman (1942) used to define Catlow Twine are fairly confining, meaning that each object must contain those diagnostic features (i.e., close simple twined, Z-twist weft direction, and paired cordage warp); otherwise, I did not consider an object to be Catlow Twine. In a few cases, Cressman (1942) noted that most but not all specimens possessed a certain attribute. For example, he observed that weft twist is usually but not always Z-twist (i.e., down-to-the-right). Therefore, I expected that most objects previously recognized as Catlow Twine would have a Z-twist weft. Nevertheless, I recorded weft twist direction. While I did observe simple close-twine basketry with an S-twist weft in a few objects, only one also contained a cordage warp expected for Catlow Twine (Cressman 1942).

Second, I recorded warp insertion (i.e., warp splicing). Adovasio (1977) describes three ways (Type 1a/b, Type 2a/b, and Type 3) that a weaver can increase the size of their twined vessel as they move away from the start and into the base, wall, and rim of a basket. Cressman's (1942) description of warp insertion includes only two types, which groups Types 1a/b and Type 2a/b into one type. Two of the three ways to increase vessel size (Types 1a/b and 2a/b) include the insertion of new warps by the weaver. The third variation is when the weaver uses a "built-in reservoir of pre-packaged warps" which is incorporated into the center when the basket is first constructed (Adovasio 1977:40). Type 1a and 1b are technologically the same in that the weaver adds warp elements into the weft crossings (Figure 4.8). The difference between the two types is that in Type 1a the weaver incorporates the new warp element into the pre-existing weft crossing, while in Type 1b the weaver initiates a new weft crossing at the insertion of the warp. Types 2a and 2b (see Figure 4.8) are when the weaver doubles the warp when it is inserted by folding it into a U or V shape. Both ends project toward the rim and the loop is then engaged at the weft crossing. With Type 2a, the weaver adds warps into the preexisting weft crossings. With Type 2b, the weaver creates new weft crossings when the folded warp is added. Type 3 is identified when the weaver bundles all or most of the warps needed to complete the basket in the start (Figure 4.9). These warps are initially combined by the weaver, and separation of the warps begins as the weaver moves away from the center and into the wall of the basket. Cressman (1942) also discussed this splicing type, which is also considered a start type (Type 3).

Third, I recorded start types by classifying them into four nominal categories. Start Type 1 (see Figure 4.9) combines the three Catlow Twine start types that Cressman (1942) described despite some minor stylistic differences (e.g., number of warp units in the start, doubling of warps by folding, and how the weft element is first engaged, or wrapped around the starts). Start Type 2 warp starts are characterized by many warp units being bundled and wrapped by the weft and then immediately split into smaller warp units. These warp units are then continuously separated into smaller warp rows, creating a sun-like pattern with no splicing in the base (Figure 4.10). Start Type 3 warp starts are characterized by cordage warps that are distributed parallel to each other (Figure 4.11). The weft is then wrapped around the cordage warps several times and the twining begins immediately as the weaver separates small bundles of warps into new weft rows. Start Type 4 starts are like Type 3 because all the warps are laid parallel to each other, but the center warps are exposed rather than wrapped in the initial weft row (Figure 4.12). Type 3 and Type 4 warp starts also differ from Type 1 and Type 2 starts because the start shape can be either circular or oval.

Finally, I recorded the presence/absence of decoration on archaeological and ethnographic basketry. As noted above, Cressman (1942) described four methods of decoration in Catlow Twine basketry: (1) plain twine overlay consisting of one or two strands (see Figure 4.7a); (2) wrapped twine overlay (see Figure 4.7b); (3) false embroidery (see Figure 4.7c); and (4) insertion of dyed materials. In my analysis, I observed three other decoration types beyond those that Cressman (1942) noted: (1) a change in the direction of weft twist (i.e., S-twist); (2) triple weft (three strand twining); and (3) the attachment of marine shells during the twining process. I also observed the insertion of decorative materials (e.g., marine shells beads, glass beads, and leather) in ethnographic specimens. I excluded undecorated specimens from my comparison of decoration types. I also excluded dyeing because archaeological specimens may lose their color over time.

Results

The samples of Catlow Twine and Klamath-Modoc basketry display little difference in weft direction; both are almost exclusively Z-twist, which is the dominant weft direction used by prehistoric weavers in the northwestern Great Basin (Adovasio 1986a). The lone exception is a Catlow Twine wall fragment from the Johnson Site (Sac-6) in California (Baumhoff 1957), which possesses an S-twist weft. Among the ethnographic basketry, there is notable variation in the spin and twist of warp units. Cressman's (1942) description of Catlow Twine suggests that most baskets should contain a cordage warp where two single elements are spun in a clockwise motion (S-spun) and the combined units are then twisted counterclockwise (Z-twist), resulting in cordage that is S-spun with a Z-twist (Z/ss). Considering that some researchers (e.g., Connolly 1994; Cressman 1942; Shanks 2016) describe Klamath-Modoc basketry as indistinguishable from Catlow Twine in wall construction, the sample of Catlow Twine contained mostly objects with warps that were S-spun Z-twist (Z/ss) (n=64). Only two specimens possess the opposite warp construction (S/zz). In contrast to the archaeological sample, only 15 ethnographic objects contained the expected Z/ss warp construction and 29 contained the opposite spin and twist (S/zz). Twenty ethnographic objects contained warps with a mixture of both types. The warp spin and twist are significantly different between the two samples ($\chi^2 = 48.51$, $df = 1$, $p < .001$). The standardized residuals indicate that a Z/ss cordage warp is significantly more common than S/zz cordage warp in the archaeological sample while the opposite holds true for the ethnographic sample. Table 4.3 summarizes the warp types present in the archaeological and ethnographic samples.

Table 4.4 summarizes the ways in which new warps were inserted into new weft rows (see Figure 4.8). Type 1a (when new warps are inserted into the weft crossing and held in place until the following weft row) is the splicing type present most often in both the archaeological (*n*=27) and ethnographic samples (*n*=47). Type 1b splicing (when the new warp is added, and it immediately becomes a new warp row) occurs only in the ethnographic sample (*n*=2). Type 2a splicing (when the warp is doubled by folding it into a U- or V-shape and new warps are added to the preexisting warp rows and then split into new warp rows after it is added) is absent in both the archaeological and ethnographic samples. Type 2b splicing (when the warp is doubled by folding it into a U- or V-shape and the new warps are added and separated into new warp rows immediately) occurs four times in the ethnographic sample and is absent in the archaeological sample. While Type 2a/b splicing is absent in the sample of Catlow Twine basketry that I analyzed, it is important to note that Cressman (1942) observed Type 2b splicing in a Catlow Twine specimen from Humboldt Cave, which demonstrates that this splicing type was used prehistorically. Finally, Type 3 splicing (when the weaver starts the basket with most or all the warps needed to expand and finish the manufacturing and warps are then subdivided) occurs once in the ethnographic sample and is absent in the archaeological sample, although it should be noted that this type of warp separation is often seen in the ethnographic Klamath-Modoc starts. In sum, warp splicing is uniform in the archaeological sample (all Type 1a) but variable in the ethnographic sample (Types 1a, 1b, 2b, and 3 occur).

Table 4.5 summarizes the differences in start types observed in archaeological Catlow Twine and ethnographic Klamath-Modoc basketry. As mentioned earlier, Cressman (1942) noted that among the sample of Catlow Twine basketry from northern Great Basin sites, basketry starts were all based on the same simple technique (warps arranged in non-intersecting arcs and the warp insertion beginning almost immediately following the first weft row). While small stylistic differences (e.g., the number of warps used, the way in which the weft is initiated in the twining process, and the types of wefts used) occur in the Catlow Twine sample, they are all based on the same basic technique. While only 10 Catlow Twine artifacts have intact starts, they are all Type 1 and they are all circular in shape. Klamath-Modoc basket makers also used Type 1 starts, but the Catlow Twine sample differs from the ethnographic sample because they are finer, and this fineness seen in the start is mimicked in the wall construction. Furthermore, Klamath-Modoc basket makers used more variation in their starts. While the technique of laying the warps in non-intersecting rows was also used by ethnographic Klamath-Modoc weavers, all the starts have some sort of built-in splicing mechanism, which includes bunching multiple warp units in the start. Klamath-Modoc basketry starts are more robust, and little to no warp splicing is needed in the base of the baskets. Instead, the warp units are separated as twining continues into the wall of the vessel. The way in which the weft unit is initially engaged in the start also varies ethnographically. In addition to Type 1 starts, I observed three other types in the ethnographic sample: six artifacts have a Type 2 start; 14 have a Type 3 start; and nine have a Type 4 start. The Type 4 start differs significantly from the other start types because the warp units are exposed in the center of the basket. This structural difference is absent in the archaeological sample. In sum, as is the case with warp splicing techniques, start types are more variable in the ethnographic sample than in the archaeological sample.

Finally, the types of decoration used in the archaeological and the ethnographic samples vary (Table 4.6). Only one archaeological specimen possesses a change in weft direction (i.e., an S-twist stitch slant); this trait is absent in the ethnographic sample. Overlay is the most common decoration type in both the ethnographic (n=36) and archaeological (n=38) samples. False embroidery is more common in the archaeological sample (n=8) than in the ethnographic sample (n=1). Triple weft (three strand) twining, which is both decorative and structural in nature, is more common in the ethnographic sample (n=6) than the archaeological sample (n=2). Added dyed weft materials are present in almost all the baskets (n=50) in the ethnographic sample and absent in the archaeological sample despite Cressman's (1942) mention of this decoration type. Finally, beads (shell or glass) are present but uncommon in both the ethnographic (n=1) and archaeological (n=1) samples. I excluded wrapped twine overlay, which Cressman (1942) discussed, because it is not always a decorative feature but instead serves as a mechanism for floating materials used in overlay (Shanks 2015). If objects contained dyed weft materials as well as a structural decoration such as false embroidery, overlay, or triple weft twining, I included the structural decoration type in my comparison. A majority (n=43) of the ethnographic objects contained dyed weft materials along with a secondary decoration type (overlay, false embroidery, or triple weft) while no archaeological samples contained dyed wefts as a primary decoration type, although materials such as quill, cattail, and reed were often dyed and used as overlay in the archaeological sample. Again, the lack of dyed materials in the archaeological sample may be due to the degradation of coloring over time. A Fisher's Exact Test demonstrates that the differences in decoration type between the archaeological and ethnographic samples are significant (*p*=.027) (Table 4.6).

Discussion

At face value, Catlow Twine basketry exhibits more than 9,000 years of technological continuity (Barker et al. 2012; Connolly 1994; Fowler and Hattori 2007; Hattori and Fowler 2006; Hattori et al. 2016; Shanks 2015). Attributes of Catlow Twine such as basic wall construction appears to have remained virtually unchanged across time (Fowler and Hattori 2007). Some researchers (e.g., Adovasio 1977, 1986a; Jolie 2014; Petersen et al. 2001) argue that basic wall construction techniques are conservative and less likely to rapidly change without an external factor such as migration, which causes shifts in cultural boundaries, assimilation, and/or acculturation, all of which can cause significant cultural disruption. Jolie (2014) notes that structural content in which few alternatives exist (e.g., starting and finishing methods and twined weft slant direction) is transmitted consistently within groups. If this is the case, then what would account for the differences between Catlow Twine technology and Klamath-Modoc basketry?

Based on the results of my comparison of Catlow Twine and Klamath-Modoc basketry, external influences related to the arrival of Euro-Americans appears to have affected basic basketry attributes (e.g., warp spin and twist, warp splicing, starts, and decoration) in the region. Understanding which aspects of Euro-American contact that caused Klamath and Modoc people to alter their traditional basket making techniques is difficult to determine. Were these changes gradual or were they sudden? Were they in response to contact with other tribes and/or Euro-Americans, or instead to basketry becoming a market commodity? By examining the sequence of events that took place before, during, and following Euro-American contact, I provide some evidence of how and when these changes may have occurred.

Direct contact between Native Americans and Euro-Americans occurred late in the Great Basin and portions of Northern California compared to other parts of the country, but the effects of indirect contact (e.g., disease, technology, exploitation of natural resources, introduction of the horse) were felt by the early 1700s (Malouf and Findlay 1986; Spier 1930). The use of horses by Native Americans expedited transportation and increased the spread of knowledge and goods as well as raiding between neighboring tribes (Spier 1930). Spier (1930) notes that the Klamath and Modoc people descended frequently on Achumawi (Pit River) and Atsugewi (Shasta) territory, often killing men and taking women and children as slaves to sell at The Dalles on the Columbia River. Direct contact occurred in 1826 when Peter Skene Ogden, a representative of the Hudson Bay Company, entered Klamath-Modoc territory (Deur 2009). The Hudson Bay Company was extremely influential in the relations between Native Americans and both European and Euro-American groups. In fact, the Klamath sided with the British claims of the Oregon Country over the U.S. claims (ca. 1820).

In December of 1843, John C. Frémont reached the shore of the Klamath Marsh. He returned in May of 1846 and his party was attacked by either a Klamath or Modoc group. He retaliated by raiding and burning a Modoc village (Spier 1930). In 1846, the Applegate Emigrant Trail was established through the Klamath-Modoc homelands, which caused severe disruptions of traditional lifeways (Deur 2009). The Modoc and Pit River tribes were severely affected by Euro-American settlement due to the location of their villages and were “all but annihilated” (Spier 1930:8) during the Oregon Wars of the 1850s. Later, the Treaty of 1864 placed the Klamath, Modoc, and Yahooskin Paiute together on the Klamath Reservation. Once there, Euro-American settlement and agricultural practices continued to disrupt indigenous culture (Deur 2009). The Modoc resisted removal from their homelands, which resulted in the Modoc War of 1872-1873, in which the Klamath did not participate. Despite their resistance, the Modoc and Yahooskin Paiute were ultimately forced to live with the Klamath on the Klamath Reservation, where members were required to acculturate within a single generation. Missionaries and Indian agents became the “social architects” (Deur 2009:212) of the newly formed reservation and the Klamath, Modoc, and Yahooskin Paiute cultures changed dramatically (Stern 1956, 1965, 1998). The sequence and nature of these events demonstrates that while Klamath and Modoc people had similar experiences, they were not one and the same, which makes me question the grouping of Klamath and Modoc basketry into a single category (Klamath-Modoc).

Historically, the Klamath and Modoc were separate populations. While they shared ties through language, intermarriage, military alliance, and social, economic, and ritual activities (Ray 1963; Sobel and Bettles 2000; Spier 1930), there were some differences between Klamath and Modoc basketry early in the ethnographic period, which could account for some of the differences I observed between the archaeological and ethnographic samples, and the variation within the ethnographic sample itself. Gogol (1983) noted that some earlier Modoc baskets are relatively modest in design but as basketry became a market commodity during the Arts and Crafts Period (ca. 1880-1920), Modoc weavers became less conservative than Klamath weavers and often used materials including bear grass (*Xerophyllum tenax*) and bracken fern (*Pteris aquilinium*) borrowed from neighboring Californian groups. Additionally, Modoc baskets made before ca. 1900 were more likely to use Euro-American materials such as colored yarn and strips of trade-cloth. Modoc weavers also implemented a reinforcing multi-strand (triple weft) pedestal around the base of their baskets. Klamath weavers used *Phragmites* sp. for overlay while the Modoc more often used bear grass (Gogol 1983; Shanks 2015).

Following Euro-American contact, baskets were no longer needed by Native Americans for hunting and gathering activities (Bibby 1996) and it was not until the Arts and Crafts Period that settlers sought handmade items such as baskets for their homes (Bibby 1996; Crawford 1986). While traditional baskets continued to be used by natives for nontraditional tasks, it was likely the “collector’s market” (Bibby 1996:3) that provided incentive for Native Americans to continue making baskets. During this time, some of the finest basketry was produced by weavers using traditional materials and technologies with innovative forms and design schemes, such as zoomorphic figures, flowers, humans, and other Western motifs, and weavers experimented with the shapes of their baskets (Bibby 1996; Gogol 1983). These baskets became valuable and Native American women became important contributors to the household economy (Bibby 1996; Crawford 1986). Basket making became important again during this period and many of these baskets were produced explicitly for sale to Euro-American collectors.

The differences in weaving preferences between the Klamath and Modoc people as well as events related to Euro-American arrival to the western United States probably account for many of the differences between archaeological Catlow Twine and ethnographic Klamath-Modoc basketry. For example, one of the major differences that I observed is a change in the consistency of warp spin and twist. While all but two of the archaeological samples are Z-spun S-twist (Z/ss), the ethnographic sample includes S/zz, Z/ss, or a combination of both. Only two archaeological objects, both from California, have S/zz cordage warps, the opposite of what is traditionally considered Catlow Twine. This raises the question of why this fundamental change in wall construction happened primarily after contact.

While there is very little documentation for the ethnographic basketry and which individuals made which baskets, there are a few cases where particular baskets can be attributed to either Klamath or Modoc weavers (as opposed to the combined Klamath-Modoc title). Among the ethnographic collections there are nine baskets attributed to Modoc weavers. Of these nine baskets, two contain a combination of warp types (Z/ss and S/zz) and seven contain a S/zz warp type, which is the opposite warp spin and twist I observed in most of the Catlow Twine basketry. Two of the nine ethnographic Modoc baskets are attributed specifically to a Modoc woman named Toby Riddle (*Wi-ne-mah*), who was a translator that helped with negotiations between the Modoc and Euro-Americans during the Modoc War (1872-1873). These two baskets, one a bowl (1-71107 PHMA) and the other a Euro-American style hat (1-27235 PHMA), both contained exclusively Z-spun S-twist (S/zz) warps. This brings into question whether this trait existed prehistorically in Catlow Twine basketry made by Modoc weavers. If this is the case, I did not observe it in the archaeological collections. If this change took place after contact, then a change in warp spin and twist could be attributed to interactions between Klamath and Modoc weavers and other neighboring tribes (Gogol 1983; Shanks 2015).

The differences that I observed between Catlow Twine and Klamath-Modoc starts, warp insertion (splicing), and decorations types could be attributed to the effects of culture contact as well as the influence of Arts and Crafts Period preferences. Dawson's (1970-1992) notions of *conservative originators* and *creative innovators* may help explain why that was the case. Conservative originators developed basketry types and were resistant to change, whereas creative innovators manipulated conservative basketry when new ideas and/or technology emerged because there were no traditional rules that existed to govern manufacturing (Jolie 2014). It is possible that Dawson's ideas characterized the Yahooskin Paiute and Modoc's forced relocation to the Klamath Reservation. Also, as basketry became a cash commodity, there could have been no discrimination when it came to basketry manufacturing. If this is the case and multiple people were employed as basket makers despite tribal affiliation, age, or gender, then some people living on the Klamath Reservation may have become creative innovators during the manufacturing of Klamath-Modoc style basketry. For example, Kelly (1932) notes that the Northern Paiute used both S-twist (up-to-the-right) weft and Z-twist (down-to-the-right) wefts for manufacturing twined basketry. The two different types of wefts were used indiscriminately and often next to each other in the same vessel. This technique was not used to create a pattern and is discussed by Kelly (1932) as indicative of carelessness and the absence of a single standard slant. Perhaps the combination of both Z-twist and S-twist cordage warps present in the ethnographic Klamath-Modoc basketry reflects the Yahooskin Paiute basket makers' lack of concern with a standardized direction.

The variation in start types among ethnographic Klamath-Modoc basketry compared to archaeological Catlow Twine basketry also demonstrates innovation among basket makers during this time. This innovation and/or expression of identity can be seen in the variation of basketry starts used in the ethnographic sample. It is difficult to determine if these changes are stylistic and in response to the Arts and Crafts movement, or an expression of cultural variation between the Klamath, Modoc, and Paiute people living together on one reservation. Start types are known to vary within the same group and sometimes in baskets made by the same weaver (Gene Hattori, personal communication, 2016).

The disruption to Native American culture that took place before, during, and after contact with Euro-American populations is a plausible explanation for the differences in basic basketry construction between the archaeological and ethnographic samples; however, if this was the case then is it safe to assume that ethnographic Klamath-Modoc people were somehow related to prehistoric populations? If so, what other evidence points to this connection? The archaeological record of the northwestern Great Basin displays connections to California archaeological cultures and there is a lack of continuity between the archaeological cultures of western Nevada and south-central Oregon and the ethnographic Numic cultures that occupied areas where Catlow Twine is found archaeologically (Aikens and Witherspoon 1986). The circumstances under which this occurred continued to be debated (see Aikens and Witherspoon 1986; Bettinger and Baumhoff 1982; Madsen and Rhode 1994) but it is likely that ancestral Penutian speakers moved to the periphery of the Great Basin ~1,000 cal B.P. Hattori (1982) suggests that these prehistoric cultures were defined by a suite of artifacts (e.g., *Olivella* and *Haliotis* shell beads, polished charmstones, slate rods, bone spatulas, and pendants) from sites in western Nevada. These artifacts probably reflect groups who were ancestral to ethnographic Penutian-speakers (i.e., the Klamath and Modoc). Similarly, Aikens and Witherspoon (1986) argue that prehistoric groups identified by lake- and marsh-side villages in south-central Oregon were most likely Penutian-speaking Klamath. These hypotheses suggest that prehistorically, Penutian speakers occupied a much larger territory than at the time of Euro-American contact.

The widespread distribution and considerable antiquity of Catlow Twine basketry in the northwestern Great Basin may represent the territories of Penutian-speaking groups deep in time. The fact that the manufacturers of Catlow Twine basketry did not alter their weaving technology for thousands of years suggests strong cultural continuity until Euro-American contact. Conversely, differences between ethnographic Klamath-Modoc basketry and Catlow Twine (e.g., warp spin and twist, starts, and decoration types) probably reflect the assimilation of three groups who ultimately lived together but subtly maintained aspects of their respective cultural identities using basket making techniques (e.g., close simple twine, Z-twist weft, and cordage warp). These variations also reflect stylistic changes that took place as weavers began to manufacture basketry that was appealing to Euro-American collectors (Crawford 1986).

Conclusion

When dramatic shifts occur in basketry, researchers typically look for evidence of population replacement or the assimilation of one or more groups by another. In cases of population replacement, there are often extreme changes in technology (Adovasio 1986b; Adovasio and Peddler 1994; Fowler 1994). Conversely, in cases of assimilation stylistic changes typically overlie continued maintenance of an existing technology (Adovasio and Peddler 1994; Jolie 2014). The latter seems to be the case with ethnographic Klamath-Modoc basketry.

Catlow Twine basketry, which remained technologically unchanged for more than 9,000 years in the northwestern Great Basin, underwent substantial changes following the arrival of Euro-Americans and most especially as basketry began being made for sale. While ethnographic Klamath-Modoc basketry exhibits some stylistic differences from archaeological Catlow Twine basketry (e.g., warp splicing, starts, decoration types), its basic structure (close simple-twine basketry with a Z-twist weft and cordage warp) is essentially the same. The stylistic differences may be a function of cultural disruption tied to the forced assimilation of the Klamath, Modoc, and Paiute, but may also be tied to the Arts and Crafts Period and Euro-Americans' desire to display handmade baskets in their homes (Crawford 1986). The Klamath-Modoc style of basketry may have remained the dominant type produced on the Klamath Reservation, regardless of the tribal affiliation, age, and gender of those individuals who manufactured it. The nuances seen in ethnographic Klamath-Modoc basketry are likely a function of differences between Klamath, Modoc, and Paiute weaver's choices in manufacturing and personal preferences. Small changes to basketry wall construction could be a mechanism for Paiute and Modoc basket makers to subtly express individuality and identity in a time of uncertainty, or could be something that exists archaeologically but has not yet been observed. The lack of changes in Catlow Twine basketry for ~9,000 years suggests strong cultural continuity in the northwestern Great Basin (Camp 2016; Fowler and Hattori 2010, 2011) and is consistent with Dawson's idea that Klamath-Modoc type basketry is one of the oldest basketry technologies made in North America (Shanks 2015). The timing and nature of the change in Catlow Twine technology is also consistent with the hypothesis that Numic speakers moved into the western and northern Great Basin relatively late in time (Madsen and Rhode 1994).

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References Cited

Adovasio, James M.

1970 The Origin, Development, and Distribution of Western Archaic Textiles. *Tebiwa* 13(2):1-40.

1974 Prehistoric North American Basketry. In *Collected Papers on Aboriginal Basketry*, edited by Donald R. Tuohy and Doris L. Rendall, pp. 194-205. Nevada State Museum Anthropological Papers No. 16. Carson City.

1977 *Basketry Technology: A Guide to Identification and Analysis*. Aldine Publishing Company, Chicago.

1986a Prehistoric Basketry. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 194-205. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

1986b Artifacts and Ethnicity: Basketry as an Indicator of Territoriality and Population Movements in the Prehistoric Great Basin (with Rhonda L. Andrews). In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 43-89. University of Utah Anthropological Papers No. 110. Salt Lake City.

Adovasio, James M., and David R. Peddler

1994 A Tisket, a Tasket: Looking at the Numic Speakers through the "Lens" of a Basket. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by David B. Madsen and David Rhode, pp. 114-123. University of Utah Press, Salt Lake City.

Aikens, C. Melvin, and Younger T. Witherspoon

1986 Great Basin Numic Prehistory: Linguistics, Archaeology, and Environment. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 9-20. University of Utah Anthropological Papers No. 110. Salt Lake City.

Andrew, Rhonda L., James M. Adovasio, and Ronald C. Carlisle

1986 *Perishable Industries from Dirty Shame Rockshelter, Malheur County, Oregon*. University of Oregon Anthropological Papers No. 34. Eugene.

Barker, James P., Eugene M. Hattori, Catherine S. Fowler, and William J. Cannon

2012 *Getting Beyond the Point: Paleoindian Textiles in the Northwestern Great Basin*. Paper Presented at the 33rd Biennial Great Basin Anthropological Conference, Stateline, Nevada.

Barker, James P., Cynthia Ellis-Pinto, and David Valentine
1995 *Site Damage Assessment, Elephant Mountain Cave*. Unpublished manuscript on file, Bureau of Land Management, Reno, Nevada.

2011 Looting at Elephant Mountain Cave. *Nevada Archaeologist* 24:1-11.

Barrett, Samuel A.
1910 *The Material Culture of the Klamath Lake and Modoc Indians of Northeastern California and Southern Oregon*. University of California Publications in American Archaeology and Ethnology Vol. 5, No. 4. Berkeley.

Baumhoff, Martin A.
1957 *Catlow Twine from Central California*. Reports of the University of California Archaeological Survey Vol. 38. Berkeley.

Bedwell, Stephen F.
1973 *Fort Rock Basin: Prehistory and Environment*. University of Oregon Books, Eugene.

Bettinger, Robert L., and Martin A. Baumhoff
1982 The Numic Spread: Great Basin Cultures in Competition. *American Antiquity* 47(3):485-503.

Bibby, Brian
1996 *The Fine Art of California Indian Basketry*. Crocker Art Museum in association with Heyday Books, Sacramento.

Buechler, Hans C., and Judith-Maria Buechler
1971 *The Bolivian Imara*. Holt, Rinehart, and Winston, New York.

Camp, Anna J.
2016 Catlow Twine Basketry in the Northwestern Great Basin: Use and Reuse in the Archaeological Record. *Quaternary International* 2016:1-6.

Connolly, Thomas J.
1994 Prehistoric Basketry from the Fort Rock Basin and Vicinity. In *Archaeological Researches in the Northern Great Basin: Fort Rock Archaeology since Cressman,* edited by C. Melvin Aikens and Dennis L. Jenkins, pp. 63-83. University of Oregon Anthropological Papers No. 50. Eugene.

Connolly, Thomas J., Catherine S. Fowler, and William J. Cannon
1998 Radiocarbon Evidence Relating to Northern Great Basin. *Journal of California and Great Basin Anthropology* 20(1):88-100.

Connolly, Thomas J., and James Barker
2004 Basketry Chronology of the Early Holocene in the Northern Great Basin. In *Early and Middle Holocene Archaeology of the Northern Great Basin, Oregon,* edited by Dennis L. Jenkins, Thomas J. Connolly, and C. Melvin Aikens, pp. 241-250. University of Oregon Anthropological Papers No. 62. Eugene.

Crawford, Virginia
1986 Artistic Basketry of the North American Indian. *The Bulletin of the Cleveland Museum of Art* 73(70):278-297.

Cressman, Luther S.
1936 *Archaeological Survey of the Guano Valley Region in Southeastern Oregon*. Studies in Anthropology, University of Oregon Monograph No. 1, Eugene.

1942 *Archaeological Research in the Northern Great Basin.* Carnegie Institute of Washington Publication No. 538. Washington, D.C.

1943 Results of Recent Research in the Northern Great Basin Region of South-Central Oregon. *Proceedings of the American Philosophical Society Symposium* 86(2):236-246.

1986 Prehistory of the Northern Area. In *Great Basin,* edited by Warren d'Azevedo, pp. 120-126. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Dawson, Lawrence E.
1970-1992 Lawrence E. Dawson papers, ca. 1970-1992, BANC MSS 95/21 c. Berkeley: The Bancroft Library.

d'Azevedo, Warren L. (editor)
1986 *Handbook of North American Indians, Great Basin*, vol. 11. Smithsonian Institution, Washington, D.C.

Deur, Douglas
2009 A Caretaker Responsibility: Revisiting Klamath and Modoc Traditions of Plant Community Management. *Journal of Ethnobiology* 29(2):296-322.

Eiselt, B. Sunday
1997 *Defining Ethnicity in Warner Valley: An Analysis of House and Home*. Sundance Archaeological Research Fund Technical Report 97-2. Department of Anthropology, University of Nevada, Reno.

Emery, Irene
1966 *The Primary Structure of Fabrics, an Illustrated Classification*. The Textile Museum, Washington, D.C.

Fowler, Catherine S.
1994 Material Culture and the Proposed Numic Expansion. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by David B. Madsen and David Rhode, pp. 103-113. University of Utah Press, Salt Lake City.

Fowler, Catherine S., and Eugene M. Hattori
2007 *Defining Boundaries in the Prehistoric Western Great Basin: The Textile Evidence*. Paper Presented at the 72nd Annual Meeting of the Society for American Archaeology, Austin, Texas.

2011 Exploring Prehistoric Trade in Western Great Basin Textiles. In *Perspectives on Prehistoric Trade and Exchange in California and the Great Basin*, edited by Richard E. Hughes, pp. 201-220. University of Utah Press, Salt Lake City.

2012 Prehistoric Textile Trade and Exchange in the Western Great Basin; Outland Coiling and Catlow Twining. In *Meeting at the Margins: Prehistoric Cultural Interactions in the Intermountain West*, edited by David Rhode, pp. 92-102. University of Utah Press, Salt Lake City.

Gogel, John M.
1983 Klamath, Modoc, and Shasta Basketry. *American Indian Basketry* 10:3-16.

Grayson, Donald K.
2011 *The Great Basin: A Natural Prehistory*. University of California Press, Berkeley.

Guest, Kenneth
2016 *Essentials of Cultural Anthropology: A Toolkit for a Global Age*. W.W. Norton and Company, London.

Hattori, Eugene M.
1982 *The Archaeology of Falcon Hill, Washoe County, Nevada*. Nevada State Museum Anthropological Papers No. 18. Carson City.

Hattori, Eugene M., Thomas J. Connolly, Catherine S. Fowler, James P. Barker, Anna J. Camp, Dennis L. Jenkins, and William J. Cannon
2016 *Great Basin Textile Change and Continuity Across a Changing Landscape*. Paper Presented at the 35th Biennial Great Basin

Anthropological Conference, Reno, Nevada.

Hattori, Eugene M., and Catherine S. Fowler
2006 *Early Catlow Twining in the Western Great Basin*. Paper Presented at the 30th Biennial Great Basin Anthropological Conference, Las Vegas, Nevada.

Heizer, Robert F.
1942 Massacre Lake Cave, Tule Lake Cave, and Shore Sites. In *Archaeological Research in the Northern Great Basin*, edited by Luther S. Cressman, pp. 121-134. Carnegie Institution of Washington Publication No. 538, Washington, D.C.

Heizer, Robert F., and Alex Krieger
1956 *The Archaeology of Humboldt Cave, Churchill County, Nevada*. University of California Publications in American Archaeology and Ethnology Vol. 47, No. 1. Berkeley.

Jolie, Edward A.
2014 Technology, Learning, and Innovation in Textile Arts: Integrating Archaeological and Ethnographic Perspectives. *North American Archaeologist* 35(4):303-329.

Kallenback, Elizabeth A.
2013 The Chewaucan Cave Cache: A Specialized Toolkit from Eastern Oregon. *Journal of California and Great Basin Anthropology* 33(1):72-87.

Kelly, Isabel T.
1932 Ethnography of the Surprise Valley Paiute. *University of California Publications in American Archaeology and Ethnology* 31(3):67-210. Berkeley.

King, Mary E.
1975 Archaeological Textiles. In *Irene Emery Roundtable on Museum Textile 1974 Proceedings: Archaeological Textiles*, edited by Patricia L. Fiske, pp. 9-16. The Textile Museum, Washington, D.C.

Knez, Eugene I.
1960 *San Jong Dong: A South Korean Village*. Unpublished Ph.D. Dissertation, Department of Anthropology, Syracuse University, Syracuse.

Lave, Jane, and Etienne Wenger
1991 *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press, Cambridge.

Madsen, David B., and David Rhode (editors)
1994 *Across the West: Human Population Movement and the Expansion of the Numa*. University of Utah Press, Salt Lake City.

Malouf, Carling I., and John M. Findlay
1986 Euro-American Impact Before 1870. In *Great Basin*, edited by Warren L. D'Azevedo, pp. 499-516. Handbook of North American Indians, Vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Mason, Otis T.
1904 *Aboriginal American Basketry: Studies in Textile Art Without Machinery.* U.S. National Museum Annual Report. Government Printing Office, Washington, D.C.

Minar, C. Jill
1999 *Impression Analysis of Cord-Marked Pottery, Learning Theory, and the Origins of the Alachua.* Unpublished Ph.D. Dissertation, Department of Anthropology, University of California, Riverside.

2000 Spinning and Plying: Anthropological Directions. In *Beyond Cloth and Cordage: Archaeological Textile Research in the Americas*, edited by Penelope B. Drooker and Laurie D. Webster, pp. 85-99. University of Utah Press, Salt Lake City.

2001a Motor Skills and the Learning Process: The Conservation of Cordage Final Twist Direction in Communities of Practice. *Journal of Anthropological Research* 54:381-405.

2001b Material Culture and the Identification of Prehistoric Cultural Groups. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 94-113. Occasional Paper No. 28, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Minar, C. Jill, and Patricia Crown (editors)
2001 Learning and Craft Production. *Journal of Anthropological Research* 54:369-493.

Petersen, James B., Michael J. Heckenberger, and Jack A. Wolford
2001 Spin, Twist, and Twine: An Ethnoarchaeological Examination of Group Identity in Native Fiber Industries from Greater Amazonia. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 94-113. Occasional Paper No. 28,

Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Ray, Verne
1963 *Primitive Pragmatists: The Modoc Indians of Northern California*. Monograph of the American Ethnological Society Vol. 38. University of Washington Press, Seattle.

Rozaire, Charles E.
1969 The Chronology of Woven Materials from Seven Caves at Falcon Hill, Washoe County, Nevada. In *Miscellaneous Papers on Nevada Archaeology,* edited by Doris L. Rendall and Donald. R. Tuohy, pp. 181-186. Nevada State Museum Anthropological Papers No. 14. Carson City.

1974 Analysis of Woven Materials from Seven Caves in Lake Winnemucca Area, Pershing County, Nevada. In *Collected Papers on Aboriginal Basketry,* edited by Donald R. Tuohy and Doris L. Rendall, pp. 60-97. Nevada State Museum Anthropological Papers No. 16. Carson City.

Shanks, Ralph
2015 *Indian Baskets of Northern California and Oregon*. University of Washington Press, Seattle.

Smith, Geoffrey M., Aaron P. Olivier, Pat Barker, Anna J. Camp, David C. Harvey, and Hillary Jones
2016 A Collection of Fiber Artifacts from Southcentral Oregon. *Journal of California and Great Basin Anthropology* 36(1):149-159.

Sobel, Elizabeth, and Gordon Bettles
2000 Winter Hunger, Winter Myths: Subsistence Risks and Mythology among the Klamath and Modoc. *Journal of Anthropological Archaeology* 19(3):276-316.

Spier, Leslie
1930 *Klamath Ethnography*. University of California Publications in American Archaeology and Ethnology, Vol. 30. University of California Press, Berkeley.

Stern, Theodore
1956 The Klamath Indians and the Treaty of 1864. *Oregon Historical Quarterly* 57(3):229-273.

1965 *The Klamath Tribe: A People and their Reservation*. American Ethnological Society, Monograph No. 41. University of Washington Press, Seattle.

1998 Klamath and Modoc. In *Plateau* edited by Deward E. Walker, Jr., pp. 446-466. Handbook of North American Indians, Vol. 12, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Thomas, Wesley

1996 Shił YòòŁŁ Tool: Personification of Navajo Weaving. In *Woven by the Grandmothers: Nineteenth-Century Navajo Textiles from the National Museum of the American Indian*, edited by Eulalie H. Boner, pp. 33-42. Smithsonian Institution, Washington, D.C.

Van Hoose, Jonathan E.

2000 *Information Transmission in Pottery-Producing Systems: Memes, Artifacts, and Learning Lineages*. Paper Presented at the 65th Annual Meeting of the Society for American Archaeology, Philadelphia, Pennsylvania.

2004 *A Ceramic Perspective on Navajo-Pueblo Contacts in Early Historic New Mexico*. Paper Presented at the 69th Annual Meeting of the American Society for Archaeology, Montreal, Quebec.

Van Hoose, Jonathan E., and Kari L. Schleher

2002 *Boundaries of Learning Networks Reflected in Technological Style in Nondecorated Ceramics at San Marcos Pueblo.* Paper Presented at the 67th Annual Society for American Archaeology Meetings, Denver, Colorado.

Weltfish, Gene

1930 Coiled Gambling Baskets of the Pawnee and other Plains Tribes. Museum of the American Indian, Heye Foundation Indian Notes, Vol. 7 No. 3, pp. 277-295, New York.

1932 Problems in the Study of Ancient and Modern Basket Makers. *American Anthropologist* 33:100-117.

Table 4.1. Catlow Twine objects included in this study.

SPECIMEN NUMBER	MUSEUM	VESSEL TYPE	SITE NAME	SITE NUMBER
1-20063	UCB PHMA	Base Fragment	Lovelock Cave	NV-CH-18
1-3508	UO MNCH	Base	Catlow Cave 1	35-HA-405
1-3475	UO MNCH	Base	Catlow Cave 1	35-HA-405
1-3024	UO MNCH	Base	Catlow Cave 1	35-HA-405
WDM-106	NSM	Conical Burden Basket	Elephant Mountain Cave	26-HU-3557
WDM-105	NSM	Large Storage Basket	Elephant Mountain Cave	26-HU-3557
1069-2/1069-1b	NSM	Large Storage Basket	Kramer Cave	26-WA-196
1-8707	UO MNCH	Large Storage Basket	Roaring Springs Cave	35-HA-433
1-8710	UO MNCH	Large Storage Basket	Roaring Springs Cave	35-HA-433
31-3910	NSM	Large Storage Basket	Last Supper Cave	26-HU-102
1-31272	UO MNCH	Large Storage Basket	Chewaucan Cave	35-LK-3039
2-41070	UCB PHMA	Large Storage Basket	Lovelock Cave	NV-CH-18
31-0979	NSM	Large Storage Basket	Last Supper Cave	26-HU-102
1-3152	UO MNCH	Large Storage Basket	Catlow Cave	35-HA-405
1-18709	UO MNCH	Large Tray	Roaring Springs Cave	35-HA-433
1-3714	UO MNCH	Large Tray	Roaring Springs Cave	35-HA-433
1-8708/1-8914	UO MNCH	Large Tray	Roaring Springs Cave	35-HA-433

SPECIMEN NUMBER	MUSEUM	VESSEL TYPE	SITE NAME	SITE NUMBER
NA	UO MNCH	Large Tray	Connley Cave 5	35-LK-50
1-20070	UCB PHMA	Small Tray	Lovelock Cave	NV-CH-18
NCAT-5	NSM	Small Tray	Massacre Lake Cave	26-WA-9
1-9661	UO MNCH	Small Tray	Fort Rock Cave	35-LK-1
31-3753	NSM	Small Tray	Last Supper Cave	26-HU-102
3988	NSM	Mat	Desiccation Cave	26-WA-291
451-5	NSM	Mat	Horse Cave	26-PE-2
1069 CER-45	NSM	Mat	Kramer Cave	26-WA-196
NA	UCB PHMA	Mat	Glen Cove	SOL-236
1-62387	UCB	Mat	Altamont Cave	NA
1-34155	UO MNCH	Mat	Fort Rock Crater Cave	35-LK-3125
1-34174	UO MNCH	Mat	Fort Rock Crater Cave	35-LK-3125
1-34151	UO MNCH	Mat	Fort Rock Crater Cave	35-LK-3125
1-1237A	UO MNCH	Mat Fragment	Lake Abert Cave 2	35-LK-1407
2-41060	UCB PHMA	Mat Fragment	Lovelock Cave	NV-CH-18
2-41061	UCB PHMA	Mat Fragment	Lovelock Cave	NV-CH-18
196a	NSM	Mat/Large Storage Basket	Shinners Site A	26-WA-196
1-11981	UO MNCH	Mat/Large Storage Basket	Plush Cave	35-LK-49

SPECIMEN NUMBER	MUSEUM	VESSEL TYPE	SITE NAME	SITE NUMBER
1-34177	UO MNCH	Mat/Large Storage Basket	Fort Rock Crater Cave	35-LK-3125
31-2202	NSM	Selvage Fragment	Last Supper Cave	26-HU-102
1-8625-1-8624B	UO MNCH	Selvage Fragment	Roaring Springs Cave	35-HA-433
Z-1	NSM	Small Bowl	Massacre Lake Cave	26-WA-9
306-1	NSM	Start/Patch	Fishbone Cave	26-PE-3E
259-1A	NSM	Start/Patch	Guano Cave	26-PE-3D
1-3662A-B	UO MNCH	Wall Fragment	Catlow Cave	35-HA-405
1-43137	UCB PHMA	Wall Fragment	Humboldt Cave	NV-CH-35
1-43591	UCB PHMA	Wall Fragment	Humboldt Cave	NV-CH-35
1-43652	UCB PHMA	Wall Fragment	Humboldt Cave	NV-CH-35
1-43782	UCB PHMA	Wall Fragment	Humboldt Cave	NV-CH-35
1-44967	UCB PHMA	Wall Fragment	Humboldt Cave	NV-CH-35
1-45030	UCB PHMA	Wall Fragment	Humboldt Cave	NV-CH-35
1-45031	UCB	Wall Fragment	Humboldt Cave	NV-CH-35
1-20065	UCB PHMA	Wall Fragment	Lovelock Cave	NV-CH-18
26CH5-2014-3	UCB PHMA	Wall Fragment	Lovelock Cave	NV-CH-18
1-59201	UCB PHMA	Wall Fragment	Johnson Site	SAC-6
1-165974	UCB PHMA	Wall Fragment	Mosher Site	SAC-56

SPECIMEN NUMBER	MUSEUM	VESSEL TYPE	SITE NAME	SITE NUMBER
1-16822	UCB PHMA	Wall Fragment	Nicolaus Site 4	SAC-86
C3 3/1 C1	UO MNCH	Wall Fragment	Dirt Shame Rockshelter	35ML65
1-14705	UO MNCH	Wall Fragment	Fort Rock Cave	35-LK-1
1-14721	UO MNCH	Wall Fragment	Fort Rock Cave	35-LK-1
NSM-1200A	NSM	Wall Fragment	Last Supper Cave	26-HU-102
NSM-1200B	NSM	Wall Fragment	Last Supper Cave	26-HU-102
31-2808	NSM	Wall Fragment	Last Supper Cave	26-HU-102
31-5229	NSM	Wall Fragment	Last Supper Cave	26-HU-102
31-5062	NSM	Wall Fragment	Last Supper Cave	26-HU-102
31-238	NSM	Wall Fragment	Last Supper Cave	26-HU-102
31-5229	NSM	Wall Fragment	Last Supper Cave	26-HU-102
31-5063	NSM	Wall Fragment	Last Supper Cave	26-HU-102
31-245	NSM	Wall Fragment	Last Super Cave	26-HU-102
1-12004	UO MNCH	Wall Fragment	Plush Cave	35-LK-49
1-65980	UCB PHMA	Wall Fragment	Mosher Site	SAC-56

Table 4.2. Ethnographic Klamath-Modoc basketry included in this study.

SPECIMEN NUMBER	MUSEUM	CULTURAL AFFILIATION	VESSEL TYPE
1-15601	UO MNCH	Klamath	Bag
1-790	UO MNCH	California Modoc	Bowl
1-791	UO MNCH	California Klamath	Bowl
2-465	UO MNCH	Plateau Eastern-Oregon	Bowl
2-466	UO MNCH	California Modoc	Bowl
1-9780	UO MNCH	Klamath	Bowl
1-9784	UO MNCH	Klamath-Modoc	Bowl
1-9791	UO MNCH	Klamath-Modoc	Bowl
1-9793	UO MNCH	Klamath-Modoc	Bowl
1-9794	UO MNCH	Klamath-Modoc	Bowl
1-9796	UO MNCH	Klamath-Modoc	Bowl
1-15596	UO MNCH	Klamath	Bowl
1-15602	UO MNCH	Klamath	Bowl
1-36924	UO MNCH	Klamath	Bowl
1-36941	UO MNCH	Klamath	Bowl
1-36963	UO MNCH	Klamath	Bowl
1-36975	UO MNCH	Klamath	Bowl
1-61775	UCB PHMA	Klamath-Modoc	Bowl
1-211491	PHMA	Modoc	Bowl
1-10627	PHMA	Klamath-Modoc	Bowl
1-71107	PHMA	Modoc	Bowl
1-255622	UCB PHMA	Modoc	Bowl
1-259254	UCB PHMA	Modoc	Bowl
1-36923	UO MNCH	Klamath	Hat
1-28602	UCB PHMA	Klamath-Modoc	Burden Basket
1-71140	UCB PHMA	Klamath-Modoc	Burden Basket

SPECIMEN NUMBER	MUSEUM	CULTURAL AFFILIATION	VESSEL TYPE
1-15606	UO MNCH	Klamath	Conical Basket
1-4230	UCB PHMA	Klamath-Modoc	Hat
1-14229	UCB PHMA	Klamath-Modoc	Hat
1-12738	UCB PHMA	Klamath-Modoc	Hat
1-14229	UCB PHMA	Klamath-Modoc	Hat
1-12653	UCB PHMA	Klamath-Modoc	Hat
1-27235	UCB PHMA	Modoc	Hat
1-12465	UCB PHMA	Klamath-Modoc	Large Tray
1-36950	UO MNCH	Klamath	Large Tray
1-6719	UO MNCH	Klamath	Large Tray
1-123401	UCB PHMA	Klamath-Modoc	Large Tray
1-14215	UCB PHMA	Klamath-Modoc	Large Tray
1-97976	UCB PHMA	Klamath-Modoc	Large Tray
1-12341	UCB PHMA	Klamath-Modoc	Large Tray
1-224005	UCB PHMA	Klamath-Modoc	Large Tray
1-12851	UCB PHMA	Klamath-Modoc	Large Tray
1-67904	UCB PHMA	Klamath-Modoc	Large Tray
1-14245	UCB PHMA	Klamath-Modoc	Storage Basket
1-255478	UCB PHMA	Modoc	Quiver
2-14321	UCB PHMA	Klamath-Modoc	Quiver
1-144932	UCB PHMA	Klamath-Modoc	Quiver
1-15608	UO MNCH	Klamath	Wokas Shaker

Table 4.3. Comparisons of warp spin, and twist type. Numbers in parentheses represent standardized residuals with significant values bolded.

	WARP SPIN AND TWIST TYPE	
SAMPLE	**S-spun Z-twist (Z/ss)**	**Z-spun S-twist (S/zz)**
Archaeological Catlow Twine	64 (**+2.34**)	2 (**-3.73**)
Ethnographic Klamath-Modoc	15 (**-2.86**)	29 (+**4.57**)

$\chi^2 = 48.51$, $df = 1$, $p < .001$

Table 4.4. Comparison of warp splicing type.

	WARP SPLICING TYPE				
SAMPLE	**Type 1a**	**Type 1b**	**Type 2a**	**Type 2b**	**Type 3**
Archaeological Catlow Twine	27	0	0	0	0
Ethnographic Klamath-Modoc	47	2	0	4	1
TOTAL	74	2	0	4	1

Table 4.5. Comparisons of basketry start type.

	START TYPE						
SAMPLE	**Type 1**	**Type 2**	**Type 3**	**Type 4**	**n/a**	**Circular**	**Oval**
Archaeological Catlow Twine	10				59	10	
Ethnographic Klamath-Modoc	25	6	14	9		40	14
TOTAL	35	6	14	9	59	50	14

Table 4.6. Comparison of decorative elements.

	DECORATION TYPE				
SAMPLE	**S-Twist**	**Overlay**	**False Embroidery**	**Beads or Leather**	**Triple Weft**
Archaeological Catlow Twine	1	38	8	1	2
Ethnographic Klamath-Modoc	0	36	1	1	6
TOTAL	1	74	9	2	8

Fisher's Exact Test: p = .027

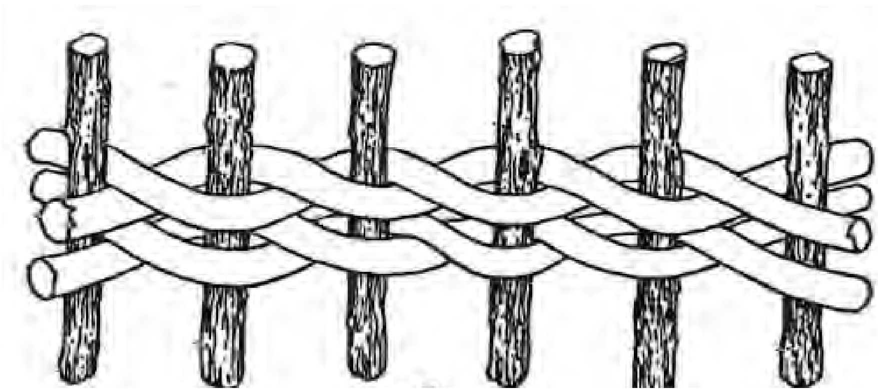

Figure 4.1. Close simple twining, showing weft (active horizontal unit) and warp unit (passive vertical unit) (image adapted from Adovasio 1970a).

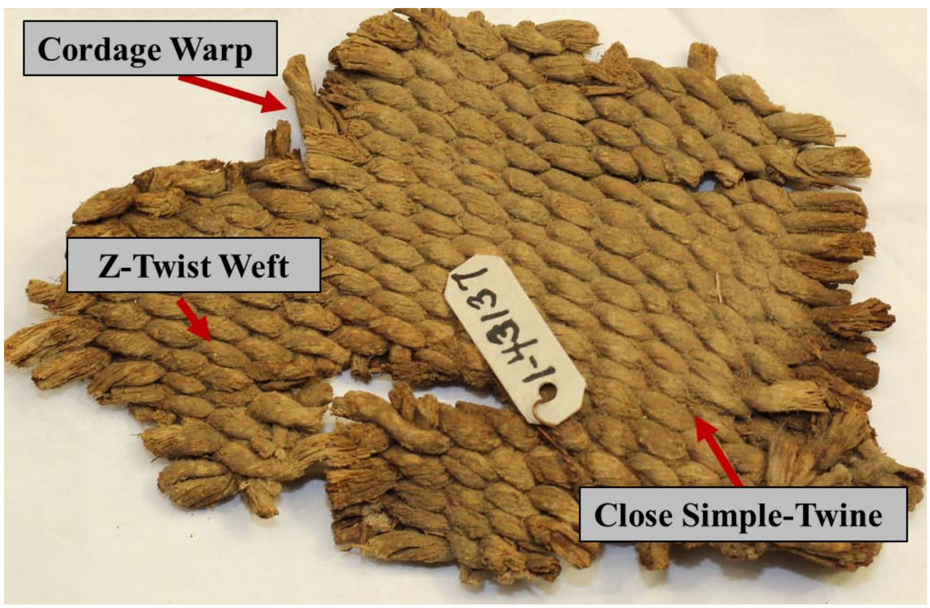

Figure 4.2. Catlow Twine basketry with weft twist down-to-the-right (Z-twist) (from the University of California, Berkeley PHMA collections).

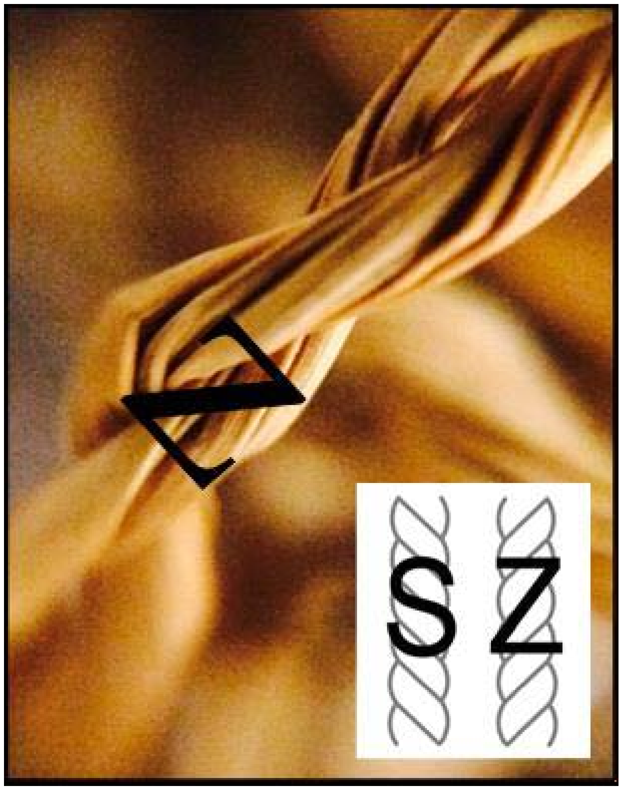

Figure 4 3. Catlow Twine cordage warp showing S-spun Z-twist (Z/ss).

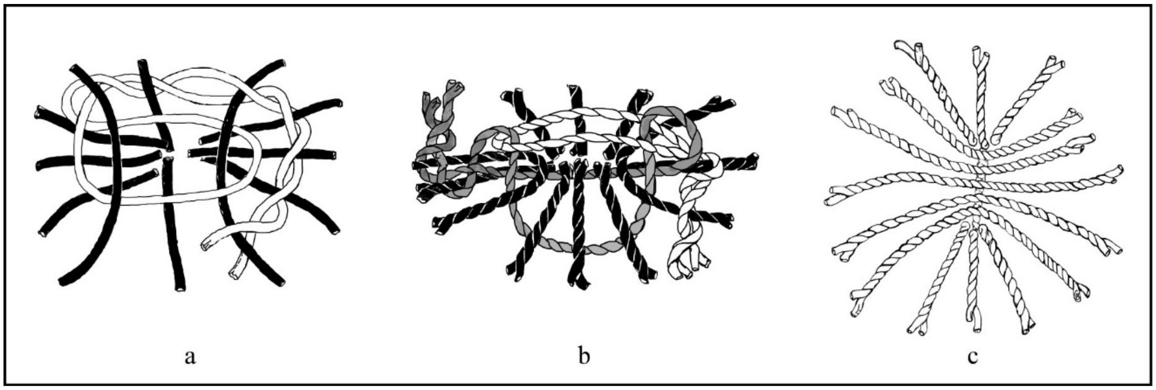

Figure 4.4. (a) Drawing of Type 1a start (not showing cordage warp) (b), Type 1b start, (c) Type 1c start. All starts listed here are combined to make Start Type 1 (image adapted from Cressman 1942).

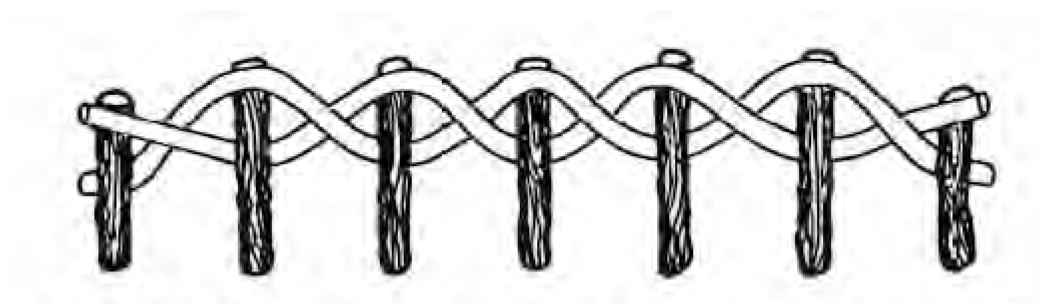

Figure 4.5. Example of simple twined end selvage with warps truncated (trimmed) after the final weft course (image adapted from Adovasio 1977).

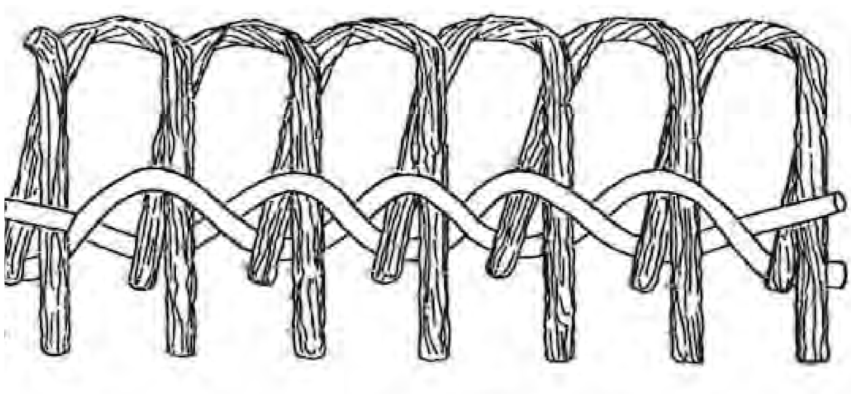

Figure 4.6. Example of twined end selvage where the terminal warps are folded at an angle (image adapted from Adovasio 1977).

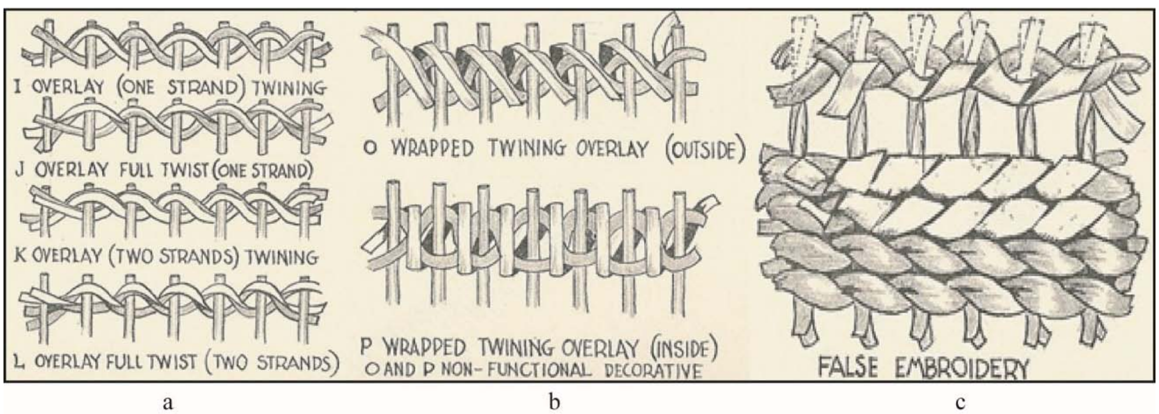

Figure 4.7. (a) overlay decoration seen in Catlow Twine, (b) wrapped twine overlay seen in Catlow Twine, (c) false embroidery seen in Catlow Twine basketry (adapted from Cressman 1942).

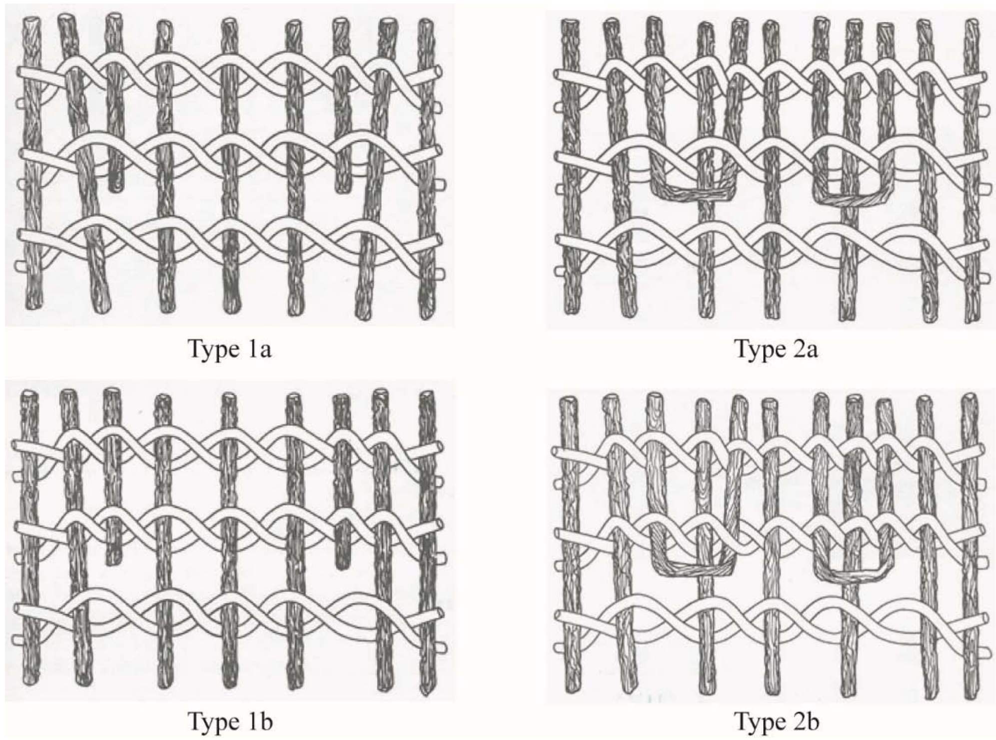

Figure 4.8. Type 1a, Type 1b, Type 2a, and Type 2b methods of adding new warp elements (warp splicing) (image adapted from Adovasio 1977).

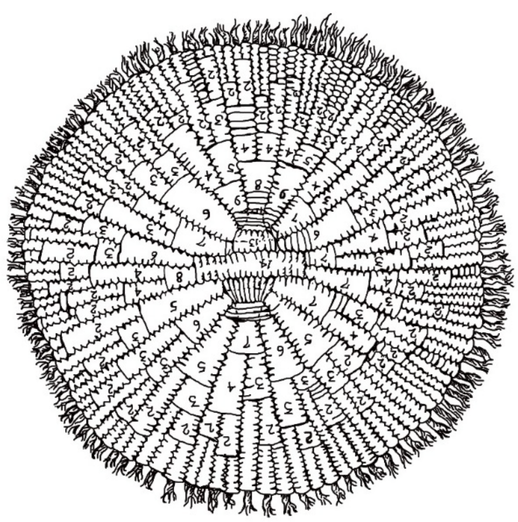

Figure 4.9. Type 3 method of increasing the size of the basket using bunched warps in the start (also Start Type 3) (image adapted from Adovasio 1977).

a b

Figure 4.10. (a) Type 2 start seen in the ethnographic sample and (b) overview of Specimen 1-10627 (courtesy of University of California, Berkeley, PHMA).

a b

Figure 4.11. (a), Type 3 start seen in the ethnographic sample and (b) overview of a large oval tray Specimen 1-67904, courtesy University of California, Berkeley, PHMA**.**

a b

Figure 4.12. (a) Type 4 start seen in the ethnographic sample and (b) overview of Specimen 1-14229 (provided by University of California, Berkeley PHMA).

Chapter 5:

CONCLUSIONS

Population movements are an important focus of archaeological inquiry in western North America because they are key to addressing broader questions about the past. In the Great Basin, many researchers (e.g., Kaestle and Smith 2001; Lamb 1958; Madsen and Rhode 1994; Sutton 1986, 1993) have attempted to track these movements using archaeological, linguistic, genetic, and ethnohistoric data, but debate over proposed events (e.g., the Numic Expansion) continues. A major problem with using archaeological data to track population movements is that generally artifact types change through time even without movements of ethnolinguistic groups. My research is different because I am interested in Catlow Twine basketry, which dominated the textile record for over 9,000 years and suggests deep ethnolinguistic continuity. In this dissertation, I drew primary on quantitative data from archaeological basketry in the Great Basin to argue that the prehistoric groups who occupied the northwestern region prior to 1,000 cal B.P. were likely members of a different population than the Numic groups who occupied the area during the contact period. Researchers (e.g., Adovasio 1970, 1974, 1977, 2016; Adovasio and Pedler 1994; Burgett 2004; Eiselt 1997; Jolie 2014; Petersen et al. 2001) have argued that basketry is useful for this type of inquiry because: (1) it is an additive rather than reductive technology, which provides evidence of weavers' step-by-step manufacturing process; (2) these processes provide measurable attributes that allow items to be categorized taxonomically; and (3) taxonomic similarities and differences provide evidence for shifting cultural boundaries. Basketry can also be directly dated, which provides researchers with information about when and for how long these objects were made. My data support the work of other textile experts who have also recognized differences between archaeological and ethnographic basketry in the region (Adovasio 1970; Adovasio and Pedler 1994; Burgett 2004; Hattori 1982; Jolie 2004).

In Chapter 2, I reviewed the frequencies of four basketry types (warp-faced plain weave, Catlow Twine, Lovelock Wickerware, and twined Numic basketry) found in the northwestern Great Basin to examine the possibility that shifts in basketry types mark population movements in this region. Radiocarbon dates for warp-faced plain weave mats and mat-based bags and their technological attributes suggest that this technology was well-made, likely made using a ground frame or loom (Fowler and Hattori 2008) but short-lived (made between ~11,000 and ~9,600 cal B.P.) (Connolly et al. 2016). Long ago, Cressman (1942) suggested that there was a technological link between the use of Z/ss cordage (as seen in warp-faced plain weave basketry) and Catlow Twine, which appeared ~9,400 cal B.P. soon after warp-faced plain weave disappeared. Whether this technological link means that the makers of these two basketry types were somehow genetically or culturally related remains unclear. The persistence of Catlow Twine at some western Great Basin sites until ~1,000 cal B.P. suggests that its makers either occupied the area sporadically or maintained ties with people there well into the late Holocene. Catlow Twine became the major basket technology ~7,900 cal B.P. and continued to be made there until Euro-American contact. Many researchers (Barrett 1929; Cressman 1942) suggest that Catlow Twine basketry is technologically related to ethnographic Klamath and Modoc basketry, suggesting there was deep ethnolinguistic continuity in the northern Great Basin.

Lovelock Wickerware is found only in the western Great Basin and is the majority type at Lovelock and Humboldt caves. It is also found at sites in the Winnemucca Lake Basin but in much lower numbers than at sites in the Humboldt Basin. Lovelock Wickerware was manufactured between ~3,500 and ~600 cal B.P. and used mainly to make conical burden baskets (Loud and Harrington 1929). It seems to have been a locally-made technology and, like warp-faced plain weave, was short-lived. The disappearance of this technology type corresponds with linguistic, genetic, and ethnohistoric evidence suggesting a movement of Numic-speaking people into the area and a movement of other people (possibly Penutian- or Hokan-speaking) out of the area. Twined Numic style basketry appears following the disappearance of Lovelock Wickerware ~400 cal B.P. It is generally not found in large quantities in the northern and western Great Basin and is rarely found at sites with long records of human occupation. The late appearance of this basketry type seems to correspond with other data suggesting a relatively late arrival of Numic-speaking populations to the northern and western Great Basin.

In Chapter 3, I compared various attributes of Catlow Twine basketry through time and space to see if it is technologically and stylistically homogeneous in the northwestern Great Basin. I compared both basic technological (weft and warp types and splicing techniques, start types, and selvage types) and decorative attributes (overlay, false embroidery), decorative designs (concentric circles, triangles, rectangles), and vessel types (bowls, hats, trays, mats). Generally, there are no differences in the basic technological attributes across time or space, suggesting that the makers of Catlow Twine basketry in the northern and western Great Basin were likely related and occupied both areas for a very long time.

In Chapter 4, I tested the hypothesis that ethnographic Klamath and Modoc groups were closely related to the prehistoric occupants of the northwestern Great Basin. I compared the technological attributes of Catlow Twine basketry from archaeological contexts to ethnographic Klamath and Modoc basketry. I determined that Catlow Twine and Klamath/Modoc basketry has many similarities (weft twist, cordage warp, use of overlay and false embroidery, and weft splicing) but also some notable differences (variation in warp spin and twist, start types, and selvage types). These differences are likely a function of Klamath, Modoc, and Paiute people being forcibly relocated to the Klamath Reservation in the 19th Century, but could also be due to a rise in weavers manufacturing baskets for sale during the Arts and Crafts Period (ca. 1880-1920). Despite these differences, Catlow Twine appears to be technologically related to ethnographic Klamath and Modoc basketry, which provides a clear connection between the prehistoric makers of Catlow Twine and ethnographic Klamath and Modoc populations.

In sum, the results of my research suggest that: (1) earlier populations in the northern and western Great Basin were different than the Numic-speaking populations that occupied this region during the ethnographic period; (2) technological continuities in Catlow Twine basketry through time and space suggest that these earlier populations occupied a large territory before Numic populations arrived; and (3) some continuities between Catlow Twine and Klamath/Modoc style basketry suggest that the makers of Catlow Twine were likely related to Klamath/Modoc (i.e., Penutian-speaking) groups who experienced drastic changes due to colonialization, and these changes can be seen in the ways in which the Klamath and Modoc manufactured their baskets.

Future Research

My work represents the most comprehensive study of Catlow Twine basketry conducted to date, but it should serve more as a starting point for future research than the final word on the subject. Several additional research opportunities await. First, further analysis of several basketry collections is warranted. These assemblages were collected from: (1) Humboldt and Lovelock caves, two large and well-documented sites located in the Humboldt Basin, Nevada; (2) Last Supper Cave, a large and well-documented site located in the High Rock Country of northwestern Nevada; (3) Massacre Lake Cave, a small site with a modest but unstudied basketry collection; and (4) Earth Mother Cave, a site located near Pyramid Lake that produced a large but unstudied basketry collection. Last Supper Cave is especially important because it is located between the Lahontan Basin of western Nevada and the numerous smaller basins found in southcentral Oregon. It may hold clues about the nature of any interactions between groups living in the two regions and how they changed over time, Second, Catlow Twine occurs at archaeological sites in California, but it remains understudied and undated. Efforts to determine the age and distribution of Catlow Twine there will lead to a better understanding of the connections between California and Great Basin groups. Finally, additional work is needed to understand how and when different basketry technologies came together during the ethnographic period and how novel, forced interactions between unrelated ethnolinguistic populations and the beginning of the Arts and Craft Period affected Native American basketry production in the American West.

References Cited

Adovasio, James M.

1970 The Origin, Development, and Distribution of Western Archaic Textiles. *Tebiwa* 13(2):1-40.

1974 Prehistoric North American Basketry. In *Collected Papers on Aboriginal Basketry*, edited by Donald R. Tuohy and Doris L. Rendall, pp. 194-205. Nevada State Museum Anthropological Papers No. 16, Carson City.

1977 *Basketry Technology: A Guide to Identification and Analysis*. Aldine Publishing Company, Chicago.

2016 *Decorated Basketry from the Great Basin and Peru*. Paper Presented at the 35th Biennial Great Basin Anthropological Conference, Reno, Nevada.

Adovasio, James M., and David R. Peddler

1994 A Tisket, a Tasket: Looking at the Numic Speakers through the "Lens" of a Basket. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by David B. Madsen and David Rhode, pp. 114-123. University of Utah Press, Salt Lake City.

Barrett, Samuel A.

1910 The Material Culture of the Klamath Lake and Modoc Indians of Northeastern California and Southern Oregon. *University of California Publications in American Archaeology and Ethnology* Vol. 5, No. 4:240-292. Berkeley.

Burgett, Ruth B.

2004 *Coiled Basketry Designs from Charlie Brown Cave, Western Nevada*. Unpublished Master's Thesis, Department of Anthropology, University of Nevada, Reno.

Connolly, Thomas J., Pat Barker, Catherine S. Fowler, Eugene M. Hattori, Dennis Jenkins, and William J. Cannon

2016 Getting Beyond the Point: Textiles of the Terminal Pleistocene/Early Holocene in the Northwestern Great Basin. *American Antiquity* 81(3):490-514.

Cressman, Luther S.

1942 *Archaeological Research in the Northern Great Basin.* Carnegie Institute of Washington Publication No. 538. Washington, D.C.

Eiselt, B. Sunday
1997 *Defining Ethnicity in Warner Valley: An Analysis of House and Home*. Sundance Archaeological Research Fund Technical Report 97-2. Department of Anthropology, University of Nevada, Reno.

Fowler, Catherine S., and Eugene M. Hattori
2008 The Great Basin's Oldest Textiles. In *The Great Basin: People and Places in Ancient Times,* edited by Catherine S. Fowler and Don D. Fowler, pp. 61-67. School for Advanced Research Press, Santa Fe, New Mexico.

Hattori, Eugene M.
1982 *The Archaeology of Falcon Hill, Washoe County, Nevada*. Nevada State Museum Anthropological Papers No. 18. Carson City.

Jolie, Edward A.
2014 Technology, Learning, and Innovation in Textile Arts: Integrating Archaeological and Ethnographic Perspectives. *North American Archaeologist* 35(4):303-329.

Kaestle, Frederika A., and David G. Smith
2001 Ancient Mitochondrial DNA Evidence for Prehistoric Population Movement: The Numic Expansion. *American Journal of Physical Anthropology* 115:1-12.

Lamb, Sydney
1958 Linguistic Prehistory in the Great Basin. *International Journal of American Linguistics* 24(2):95-100.

Loud, Llewellyn L., and Mark R. Harrington
1929 *Lovelock Cave*. University of California Publications in American Archaeology and Ethnology No. 25. Berkeley.

Madsen, David B., and David Rhode (editors)
1994 *Across the West: Human Population Movement and the Expansion of the Numa*. University of Utah Press, Salt Lake City.

Petersen, James B., Michael J. Heckenberger, and Jack A. Wolford
2001 Spin, Twist, and Twine: An Ethnoarchaeological Examination of Group Identity in Native Fiber Industries from Greater Amazonia. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 94-113. Occasional Paper No. 28, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Sutton, Mark Q.

1986 Warfare and Expansion: An Ethnohistoric Perspective on the Numic Spread. *Journal of California and Great Basin Anthropology* 8(1):65-82.

1993 Numic Expansion in Great Basin Oral Tradition. *Journal of California and Great Basin Anthropology* 15(1):111-128.