

## AMS RADIOCARBON DATING OF GIANT ROCK SCALLOP (*HINNITES MULTIRUGOSUS*) ARTIFACTS FROM SAN MIGUEL ISLAND, CALIFORNIA, USA

Todd J Braje<sup>1</sup> • Torben C Rick<sup>2</sup> • Jon M Erlandson<sup>3</sup>

**ABSTRACT.** For at least 100,000 yr, marine shell beads have been important ornamental and symbolic artifacts intimately associated with the behavior of anatomically modern humans. In California, giant rock scallop (*Hinnites multirugosus*) beads were once thought to have been used only for the last 1000 yr, where they were considered to be markers of high social status among the Chumash Indians of the Santa Barbara Channel region. Direct accelerator mass spectrometry (AMS) radiocarbon dating of 1 giant rock scallop ornament and 2 beads from San Miguel Island extends the use of this shell for personal adornment to at least 8000 cal BP. Our study emphasizes the importance of direct AMS <sup>14</sup>C dating of artifacts to enhance cultural chronologies and clarify the antiquity of various technologies and associated behaviors. Our results also caution archaeologists when equating artifact rarity with sociopolitical complexity.

### INTRODUCTION

Beads and other shell ornaments are widely regarded as hallmarks of modern human behavior, representing important symbolic aspects of art and culture. The earliest recognized marine shell beads in the world come from Middle Stone Age levels at Grotte de Pigeons in Morocco, Skhul in Israel, and Blombos Cave in South Africa, and consist of perforated tick shells (*Nassarius* spp.) dated between about 100,000 and 75,000 yr ago (Henshilwood et al. 2004; d'Errico et al. 2005; Vanhaeren et al. 2006; Bouzouggar et al. 2007). In Australia, shell beads from Mandu Mandu Rockshelter have been dated to ~34,000 yr ago (Morse 1993), and in the New World, beads made from purple olive snails (*Olivella biplicata*) from southern California are among the oldest shell beads in the Americas, directly dated to about 11,000–9000 cal BP (see Erlandson et al. 2005a,b; Fitzgerald et al. 2005).

In California, shell beads and ornaments have long been important cultural historical time markers for archaeologists (e.g. King 1990). Prior to the advent of absolute dating techniques, shell bead typologies provided useful chronological indicators of cultural evolution, especially in coastal areas. Typological sequences of shell beads and other technologies associated with burials allowed early archaeologists to develop sophisticated culture historical sequences, many of which remain viable today (see Trigger 2006).

Shell bead typologies have been an especially fruitful avenue of study in southern California, where early Spanish chronicles and archaeological data documented formal shell bead currency and exchange networks extending throughout the Santa Barbara Channel area (Figure 1) and into distant interior regions. At first European contact, the Chumash manufactured and traded a diverse range of beads and ornaments made from *Olivella*, red and black abalone (*Haliotis rufescens*, *H. cracherodii*), California mussel (*Mytilus californianus*), clam (*Tivela stultorum*), and other shells. A seminal study of shell bead typology and evolution was conducted by Chester King (1990), who relied on the seriation of shell beads and ornaments (and other artifacts) from burial lots to explore changes in Chumash society spanning 8000 yr.

<sup>1</sup>Department of Anthropology, Humboldt State University, Arcata, California 95521, USA. Corresponding author. Email: tjb50@humboldt.edu.

<sup>2</sup>National Museum of Natural History, Smithsonian Institution, Department of Anthropology, Washington DC 20013-7012, USA.

<sup>3</sup>Department of Anthropology, University of Oregon, Eugene, Oregon 97403-1218, USA. Also: Museum of Natural and Cultural History, University of Oregon, Eugene, Oregon 97403-1224, USA.

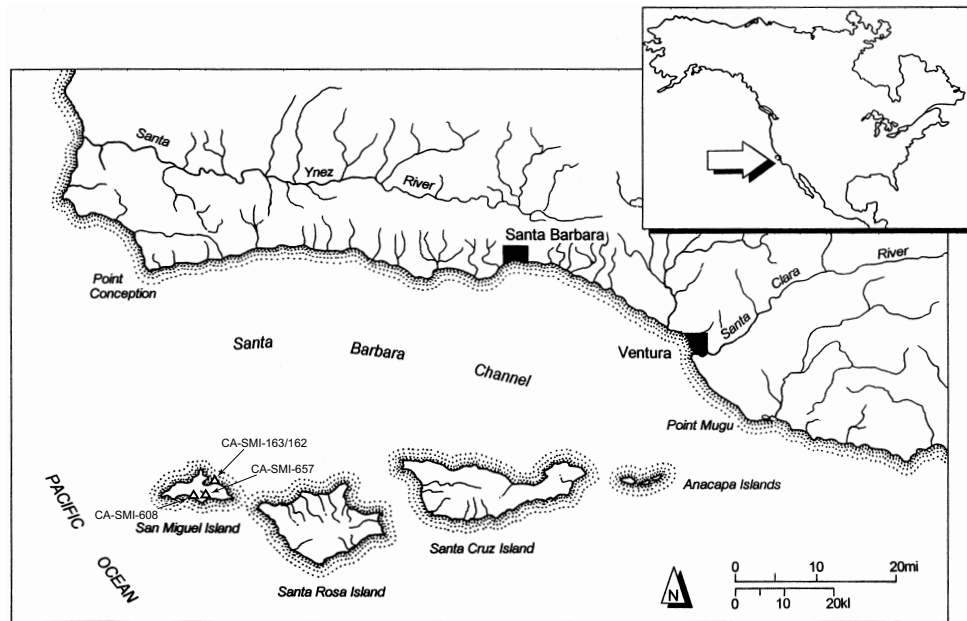


Figure 1 Map of the Santa Barbara Channel, San Miguel Island, and the sites discussed in the text

New discoveries, dates, and calibration methods have refined King's (1990) original shell bead chronology (see Kennett 2005), but his general sequence has sustained nearly 20 yr of archaeological testing, improved dating and excavation techniques, and intellectual scrutiny. Archaeologists in recent years, however, have extended the antiquity of many of the shell bead and ornament types defined by Gifford (1947), Bennyhoff and Hughes (1987), King (1990), Gibson (1975, 1992), and others. These studies have demonstrated considerable continuity in the types of shells used to make beads and ornaments through time, while recognizing the dynamic nature of their invention, production, and sociopolitical significance (see Rick et al. 2005).

In this paper, we present the first AMS dates on relatively rare rock scallop (*Hinnites multigossus*) beads and ornaments recovered from recent excavations on San Miguel Island, the westernmost of the Northern Channel Islands. We provide contextual and chronological information for 3 *Hinnites* artifacts, extending the antiquity of these objects by 7000 yr. *Hinnites* beads, previously believed to have been used for only the past 1000 yr or so (King 1990:193), were thought to signify high social status among the Chumash Indians and their neighbors. Our considerably longer chronology provides a cautionary tale about equating artifact scarcity with the emergence of cultural complexity.

## CONTEXT AND BACKGROUND

Today, San Miguel Island lies approximately 42 km off the Santa Barbara coast, but during the last glacial it formed the western end of a larger Santarosae Island (Orr 1968; Junger and Johnson 1980). The 37-km<sup>2</sup> island currently contains rolling hills, shifting dune sheets, tablelands, and marine terraces, with a Mediterranean climate and relatively impoverished terrestrial flora and fauna (Schoenherr et al. 1999). However, strong deep-water upwelling and extensive kelp forests support diverse and productive populations of shellfish, sea mammals, fishes, and seabirds, resources that attracted humans to the island for at least 11,000 <sup>14</sup>C yr.

Historically, the Northern Channel Islands and the adjacent mainland coast were occupied by the Chumash Indians, complex maritime hunter-gatherers who subsisted primarily off marine resources. The Chumash lived in large villages and towns led by hereditary chiefs and had extensive craft-specialization and trade networks. Goods and services were regularly exchanged between the islands, the mainland, and interior with shell “money beads” manufactured from the enamel (callus) portion of the *Olivella* shell, which served as a medium of exchange (King 1990; Arnold 1991, 1992, 2000, 2001; Kennett 2005; Rick et al. 2005; Rick 2007).

A number of other decorative shell bead and ornament types were also produced by the Chumash, including those created from *Olivella*, red and black abalone, Pismo clam, California mussel, Kellet’s whelk (*Kelletia kelletii*), cone shells (*Conus californica*), cowries (*Cypraea spadicea*), coffee bean shells (*Trivia californiana*), limpets (*Megathura crenulata*), and others (King 1990; Arnold and Graesch 2001:71). While several types of *Olivella* shell beads are relatively abundant in Late Holocene sites (<3500 cal BP), some archaeologists have interpreted the recovery of less common shell bead types as symbols of high status and wealth reserved for elite members of society (see King 1990). This is especially true for beads and ornaments manufactured from giant rock scallop shells, a subtidal bivalve that has bright purple or reddish-purple sections of shell located near each hinge. King (1990:193) identified rock scallop beads as important time markers for the rise of cultural complexity in the Santa Barbara Channel, for example, due to their late appearance and scarcity in the archaeological record.

Our excavations and direct dating of *Hinnites* artifacts from 3 San Miguel Island sites, however, provide new insights into the antiquity of giant rock scallop beads and ornaments. Our results speak not only to the antiquity and cultural continuity of personal ornamentation along the Santa Barbara Channel and broader Pacific coast, but also the utility of direct shell artifact dating (see Vellanoweth 2001; Rick et al. 2002; Erlandson et al. 2005a,b; Fitzgerald et al. 2005).

## METHODS

Three complete *Hinnites* artifacts were directly dated for our study. These artifacts were recovered from 3 San Miguel Island shell middens (CA-SMI-162, CA-SMI-608, and CA-SMI-657) previously dated to the Early, Middle, and Late Holocene. Each *Hinnites* artifact was cleaned, etched twice in dilute hydrochloric acid, and rinsed in distilled water to remove any contaminants. The artifacts were then sampled with a dental drill across multiple shell growth increments to average out annual variations in upwelling and the marine reservoir effect (Culleton et al. 2006). A powdered sample from each specimen was sent to the National Ocean Sciences AMS (NOSAMS, <http://www.nosams.whoi.edu/nosams.html>) facility at Woods Hole Oceanographic Institute (WHOI) for analysis. Specimens were converted to CO<sub>2</sub> by reaction with 85% phosphoric acid under vacuum and converted to graphite.

All dates were calibrated with CALIB 5.0.2 (Stuiver and Reimer 1993; Stuiver et al. 2000, 2005), applying a  $\Delta R$  of  $225 \pm 35$  yr to the reservoir correction, which is an average commonly used in the region (see Kennett et al. 1997). Radiocarbon dating of shell and charcoal pairs of 2 trans-Holocene sites on San Miguel Island, Daisy Cave and Cave of the Chimneys, demonstrated that  $\Delta R$  values fluctuated somewhat through the Holocene, including a highly variable interval between 9470 and 8910 BP (Erlandson et al. 1996; Kennett et al. 1997:1058). Kennett et al. (1997:1055) concluded that  $\Delta R$  values were relatively stable during our study interval and that the  $225 \pm 35$  yr reservoir correction is adequate for time intervals outside of 9470–8910 cal BP and 3560–3460 cal BP. Rick et al. (2002:936) also noted that using different  $\Delta R$  values reported for the area (e.g.  $233 \pm 60$  yr

[Ingram and Southon 1996];  $210 \pm 80$  yr [Kennett et al. 1997]) affected the overall calibrated age of a sample by a relatively small margin (e.g. <100 yr).

## SITE AND SAMPLE DESCRIPTIONS

### CA-SMI-608

This large eroding shell midden is exposed in a south coast gully system with intact site deposits extending for at least 50 m north-south and 80 m east-west. The shell midden ranges from 10 to 40 cm thick and formed in a well-developed paleosol buried 1.5–2.0 m below the surface. Braje and Erlandson conducted surface collections from eroding deposits and excavated approximately 600 L of intact sediments, which produced a variety of faunal remains and artifacts made from stone, bone, and shell (Erlandson et al. 2005a; Braje 2007). Four  $^{14}\text{C}$  dates were submitted from the main site area, documenting an Early Holocene occupation between about 9700 and 8500 cal BP (Table 1).

Table 1  $^{14}\text{C}$  dates from CA-SMI-163, CA-SMI-657, and CA-SMI-608.<sup>a</sup>

Site # (CA-SMI-)	Material <sup>b</sup>	Lab #	Provenience	Measured $^{14}\text{C}$ age	Conventional $^{14}\text{C}$ age	Age range (cal BP, 1 $\sigma$ )	Source
163	Hc	OS-27183	Top of Unit 2, H5	n/a	$655 \pm 60$	—	Rick 2007
163	Mc	Beta-145428	H1, 25 cm	$330 \pm 60$	$760 \pm 60$	260–80	Rick 2007
163	Mc	OS-33376	H3, Auger C, 43 cm	n/a	$830 \pm 25$	300–150	Rick 2007
163	Mc	OS-33375	H6, Auger D, 64 cm	n/a	$880 \pm 35$	370–260	Rick 2007
163	Mc	OS-33417	Unit 2, ~110 cm	n/a	$880 \pm 30$	360–260	Rick 2007
163	Mc	OS-33377	H2, Auger B, 29 cm	n/a	$885 \pm 35$	370–260	Rick 2007
163	Hc	Beta-138430	H5, Auger 3, 67 cm	$510 \pm 70$	$950 \pm 70$	440–295	Rick 2007
163	Mc	OS-37142	Auger 2, ~40 cm	n/a	$955 \pm 50$	430–310	Rick 2007
163	Charcoal	CAMS-14365	H4, probe, 10 cm	$310 \pm 60$	$310 \pm 60$	455–300	Rick 2007
163	Hr BIP	OS-34803	Unit 2, 70–80 cm	n/a	$1010 \pm 40$	480–370	Rick 2007
163	Mc	OS-34805	Unit 3, 27–28 cm	n/a	$1060 \pm 35$	510–430	Rick 2007
163	Hr BIP	OS-34802	Unit 2, 10–20 cm	n/a	$1320 \pm 30$	700–620	Rick 2007
163	Mc	OS-33374	Unit 3, 52–54 cm	n/a	$1790 \pm 25$	1170–1060	Rick 2007
163	Mc	OS-33420	Duplicate OS-33374	n/a	$1930 \pm 30$	1305–1220	Rick 2007
657	Hr	Beta-217110	Bulk Sample 1	$5460 \pm 90$	$5900 \pm 90$	6190–5970	Braje 2007
657	Ms	Beta-195745	South Locus	$6240 \pm 80$	$6670 \pm 80$	7060–6820	Braje 2007
608	Mc	Beta-180771	SE site area	$8020 \pm 80$	$8430 \pm 80$	8860–8590	Braje 2007
608	Mc	OS-44638	Bulk Sample 1	n/a	$9200 \pm 50$	9720–9540	Braje 2007
608	Hc	Beta-199106	Bulk Sample 2	$8650 \pm 60$	$9060 \pm 60$	9550–9425	Braje 2007
608	OI	OS-48347	Bulk Sample 2	n/a	$9070 \pm 45$	9540–9450	Braje 2007

<sup>a</sup>Compiled from Braje (2007) and Rick (2007).

<sup>b</sup>Hc = *Haliotis cracherodii*, Hr = *Haliotis rufescens*, Mc = *Mytilus californianus*, OI = *Olivella* bead, Ms = Marine shell, BIP = bead in production.

A single giant rock scallop ornament was recovered from the site surface, eroding from the dark midden soil (Figure 2). This ornament is from a water-rolled hinge portion of a rock scallop shell. A naturally eroded hole is present at the end opposite the hinge, and the interior edges of the body portion were ground, shaped, and flattened. This *Hinnites* ornament, probably a pendant, is a maximum of 41.6 mm long and 32.8 mm wide.

### CA-SMI-657

Located on the south-central coast, CA-SMI-657 consists of 3 shell midden loci exposed in the walls of a large gully. Each locus is buried beneath between 1–2 m of historic dune sand, with the midden



Figure 2 Giant rock scallop ornaments and beads from CA-SMI-608, CA-SMI-657 ( $n = 2$ ), and CA-SMI-162 (left to right).

dominated by large red abalone shells in a yellow-tan alluvial paleosol. Braje (2007) obtained <sup>14</sup>C samples from the midden exposures (Table 1) and excavated a 100-L bulk sample and a 2 × 1 m test unit in the eastern gully wall of the northernmost locus.

While the midden constituents were dominated by rocky intertidal shellfish and the artifact densities were relatively low (see Braje 2007), 2 unusual rock scallop beads were recovered from the test unit. These beads were made from the brightly colored hinge portion of the shell. The tube-shaped beads show remnant dark red to deep purple coloring at one end where the hinge was ground into a smooth tube shape. One lateral side of each bead was drilled and carved out, leaving a C-shaped indentation. Both ends of the beads were then drilled from the exterior to the interior, probably to allow the beads to be strung. It is also possible, however, that these colorful shell ornaments were used as sliding choker clasps on a draw string or necklace.

#### CA-SMI-162 and CA-SMI-163

This large Chumash village complex, located in the Cuyler Harbor area, contains several house depressions and dense midden deposits that appear to be over 2 m thick in places. Rick (2007) excavated CA-SMI-163 and reported large and diverse artifact assemblages, including *Olivella* and red abalone shell beads, and dense invertebrate and vertebrate faunal remains. Adjacent to CA-SMI-163 is CA-SMI-162, which contains midden deposits and a cemetery. Beads noted on the site surface included *Olivella* callus cup beads and red abalone disk beads, which suggest a similar antiquity as the adjacent village complex at CA-SMI-163. A *Hinnites* tube bead was recovered from the surface of CA-SMI-162. No *Hinnites* artifacts were identified at CA-SMI-163.

Before our study, no <sup>14</sup>C dates were available from CA-SMI-162. At adjacent CA-SMI-163, however, Rick (2007) obtained 14 <sup>14</sup>C dates, including samples from 2 excavation units, several auger holes, and other exposures around the site. These dates suggest that CA-SMI-163 was primarily occupied from about 500–150 cal BP with an ephemeral component dated to around 1200 cal BP. Artifacts recovered from CA-SMI-163 and CA-SMI-162 are consistent with this chronology.

## RESULTS

AMS analysis of the *Hinnites* artifacts produced a range of  $^{14}\text{C}$  dates spanning over 7000 yr. The ornament from CA-SMI-608 produced a conventional  $^{14}\text{C}$  age of  $7970 \pm 45$  BP. Calibration of this date yielded a  $1\text{-}\sigma$  age range of 8290–8160 cal BP (Table 2), corresponding to the younger range of several Early Holocene dates from nearby midden deposits (see Braje et al. 2004; Erlandson et al. 2005a; Braje 2007). The dating of this *Hinnites* pendant adds to the relatively narrow range of ornamental shell artifacts known to have been used along the California coast during the Early Holocene (see Erlandson 1994). Direct dating of one of the *Hinnites* beads from CA-SMI-657 produced a conventional  $^{14}\text{C}$  age of  $5920 \pm 40$  BP and a calibrated age range of 6180–6020 cal BP. A fragment of well-preserved and unmodified marine shell (food refuse) from the northern locus was also submitted for  $^{14}\text{C}$  dating, yielding a calibrated age range of 6190–5970 cal BP, a date that overlaps with the direct date on the *Hinnites* bead. Finally, direct dating of the *Hinnites* tube bead from CA-SMI-162 yielded a conventional  $^{14}\text{C}$  age of  $980 \pm 30$  and calibrated age range of 450–330 cal BP. This date correlates well with the other 14  $^{14}\text{C}$  dates from adjacent CA-SMI-163 that bracket the occupation of this large site complex between about 1290 and 150 cal BP (Rick 2007).

Table 2  $^{14}\text{C}$  dates from directly dated giant rock scallop artifacts from San Miguel Island.

Site # (CA-SMI-)	Lab #	Provenience	Measured $^{14}\text{C}$ age	Conventional $^{14}\text{C}$ age	Age range (cal BP, $1\sigma$ )
608	OS-57715	10 m NE of Unit 2	n/a	$7970 \pm 45$	8290–8160
657	OS-56706	Unit 1, level 2	n/a	$5920 \pm 40$	6180–6020
162	OS-59486	Surface	n/a	$980 \pm 30$	450–330

## DISCUSSION

Giant rock scallop tube or globular beads and ornaments have been previously identified by Gifford (1947:45–46), Harrington (1928:160–162), King (1990:192–193), and others from coastal archaeological sites located on the southern California mainland and offshore islands. In an early Smithsonian publication, Holmes (1883:225–227) illustrated and described 2 *Hinnites* beads and 1 bead preform from San Miguel Island and the mainland village complex of Dos Pueblos, beads very similar to the CA-SMI-657 specimens. Later, Harrington (1928:160–162) also identified giant rock scallop beads, describing 74 drilled tube beads from burial contexts found at CA-SBA-28 on the Santa Barbara mainland. Gifford (1947:46) studied an ethnographic collection of tube beads and concluded that they usually were found with a variety of other bead types and probably strung together for highly ranked individuals.

The most common *Hinnites* bead types are cylinder, tube, or globular forms from Late period (about AD 1300–1800) sites, constructed from the brightly colored hinge portion of the shell (King 1990:192). King (1990:192–193) concluded that tube and globular varieties, similar to the CA-SMI-162 specimen, were only made during Late period phases L2 and L3 (about AD 1500–1800) and most were manufactured on the Northern Channel Islands with examples rarely found outside the Santa Barbara Channel region. It is interesting to note that this later use of purple or red *Hinnites* beads corresponds to the Protohistoric and Historic periods following first European contacts with the Chumash, a period when colorful glass beads traded to California Indians may have stimulated the production of greater numbers of brightly colored beads. While no description is provided, King (1990:240–241) illustrated 2 beads similar to the CA-SMI-657 specimens—a tube bead with both ends drilled and a C-shaped indentation carved out from the middle. King (1990) also attributed these to his Late period phases L2 and L3, some 4500 yr younger than the directly dated beads from



our excavations at CA-SMI-657. Holmes' (1883) Dos Pueblos site contains a component of comparable antiquity to CA-SMI-657, but the lack of provenience makes it impossible to determine the age of those beads without direct dating.

Based on the restricted distribution of *Hinnites* tube beads in cemeteries and their association with other rare or "exclusive" types, King (1990:193) concluded that their use "apparently reflects the growth of complexity of the Chumash economy and of the political system." The recovery of these giant rock scallop beads and ornaments from Early and Middle Holocene shell middens, well before the documented appearance of sociopolitical complexity in Late Holocene southern California (Kennett 2005; Rick et al. 2005), is intriguing. These data suggest that giant rock scallop shells were used as raw materials in the manufacture of ornaments and beads for at least 8000 yr, a testament to their long history as important ornamental, social, and cultural symbols for the Chumash and their ancestors.

Giant rock scallops in southern California inhabit subtidal environments and the dense hinge portions of their shells are difficult to modify, shape, and drill. The energy investment required to collect these shellfish and create beads and ornaments from their shells (especially since black abalone, California mussel, and *Olivella* shells are more widely available and easier to modify) may have prevented widespread production. Their rarity in the archaeological record may reflect the increased labor investment required to collect and process them. While they appear to have been produced more regularly during the Late Holocene when populations grew, sociopolitical hierarchies emerged, and craft production increased, the presence of cylinder, tube, or globular *Hinnites* beads do not necessarily signal the emergence of elites or cultural complexity in the Santa Barbara Channel region. Although specific types of *Hinnites* beads or ornaments may still serve as good chronological markers, more direct dating of these and other artifacts is required to document such technological and artistic changes.

Our research has shown that *Hinnites* ornaments developed at least 7000 yr earlier than previously thought. Further excavations, direct dating of artifacts, and the analysis of museum collections can help archaeologists determine both the antiquity and the meaning of ancient artifact types and classes. These studies can assist archaeologists in better understanding when and how personal ornamentation and artifact types change in cultural meaning, perhaps from expressions of beauty to those of wealth and social status. Although the relatively rare *Hinnites* beads may have served as status markers for the Chumash, their occasional presence in much earlier sites raises questions about such interpretations. Ultimately, the most significant aspect of this discovery may be as a cautionary tale of equating artifact rarity with social, political, or economic complexity.

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