

## AMS RADIOCARBON DATING OF A SHELL FISHHOOK FROM SANTA ROSA ISLAND, CALIFORNIA

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**ABSTRACT.** Several single-piece shell fishhooks from CA-SRI-43 on Santa Rosa Island were dated by association to roughly 5500 cal BP and were argued to be among the oldest specimens in the region. Direct accelerator mass spectrometry (AMS) radiocarbon dating of one of these hooks provided a date of 560 cal BP, however, making it about 5000 yr younger than originally presumed. This younger date is more consistent with the regional shell fishhook chronology and demonstrates the importance of obtaining direct AMS  $^{14}\text{C}$  dates to refine artifact and site chronologies.

### INTRODUCTION

Single-piece fishhooks, usually made from abalone, mussel, or Norris top shells, were among the most important subsistence technologies for Native peoples of the central and southern California coast (Strudwick 1985, 1986). These artifacts appear to correlate with significant increases in the amount and types of fish captured, and had important impacts on human subsistence strategies, population growth, and sociopolitical developments (Glassow 1996; King 1990; Raab et al. 1995; Salls 1988; Strudwick 1985, 1986). To define the chronology of these important artifacts, most researchers have relied on associated  $^{14}\text{C}$  dates (Glassow 1996:134; King 1990:83; Raab et al. 1995; Strudwick 1985, 1986; and others), with comparatively few studies focused on direct accelerator mass spectrometry (AMS) dating of the actual specimens (but see Koerper et al. 1988, 1995).

In this paper, I present an AMS date obtained from a single-piece shell fishhook from the Fox Site (CA-SRI-43) on Santa Rosa Island (Figure 1, Table 1). This and several other hooks were dated by association to  $4790 \pm 90$  and  $5370 \pm 150$  BP (Orr 1968:100, 184–7), making their chronological placement anomalous with the notion that most fishhooks are generally younger than about 2500 years old (Glassow 1996:134, 1997:153; King 1990:231; Strudwick 1985). I present contextual information for the CA-SRI-43 deposits, supply a brief perspective on the origins and significance of the single-piece shell fishhook, and offer new insights on the chronology of this important artifact type.

### SITE BACKGROUND AND CONTEXT

CA-SRI-43 is located on a relatively broad, flat ridge between Tecolote and Arlington canyons on northwestern Santa Rosa Island. The site covers an area roughly  $30 \times 50$  m wide and is situated about 0.75 km from the coast at an elevation of approximately 100 m. During the 1950s, Orr (1968:182) excavated three  $5 \times 5$  ft (roughly  $1.5 \times 1.5$  m) units at the site, including eight human burials and the remains of four small fire pits. He also dug an  $8 \times 100$  ft ( $2.4 \times 30.5$  m) trench at roughly 1 inch (2.5 cm) intervals using a jeep with a blade attachment to form a crude dozer (Orr 1958:2, 1968).<sup>1</sup> The CA-SRI-43 deposits consist of a relatively fine, compact soil, terminating at a depth of roughly 26 inches (66 cm; Orr 1968). Most of the sediments from the units were screened over 1/8-inch mesh, but no screens were used on the trench materials.

Roughly 164 artifacts from CA-SRI-43, including six abalone and mussel shell fishhooks, triangular microdrills, *Olivella* lipped, wall, and callus beads, a modified swordfish bill, and mortars and pestles were recovered during the extensive excavations (Orr 1968:186). Precise provenience for the

<sup>1</sup>A review of Orr's catalog and site map at the SBMNH indicates that he may have excavated five units at the site rather than three as indicated in *Prehistory of Santa Rosa Island*. Size estimates for his trench also vary between  $8 \times 100$  ft and  $8 \times 40$  ft. Review of the site map suggests the trench was  $8 \times 100$  ft in area.

shell fishhooks is not currently available, but a catalog of Orr's collections for CA-SRI-43 at the Santa Barbara Museum of Natural History (SBMNH) lists the provenience for the dated fishhook (Cat. # 4376) and an abalone shell fishhook as Sq. 16M, L. 5. This appears to refer to Unit 15M and possibly to level 5.

Two uncorrected  $^{14}\text{C}$  dates of  $4790 \pm 90$  and  $5370 \pm 150$  BP on marine shells excavated from the CA-SRI-43 deposits led Orr (1968:187; see also Fergusson and Libby 1962:110; Olson and Broecker 1961:170) to conclude that the site and shell fishhooks dated to the Middle Holocene, making them the oldest fishhooks in the region. It should be noted, however, that the microblades and most of the *Olivella* bead types recovered from the site generally date to after about 1,000 years ago, suggesting the site also had Late Holocene occupations (Glassow 1997:153). To determine the age of one of the CA-SRI-43 shell fishhooks, I obtained a specimen from the SBMNH for AMS  $^{14}\text{C}$  analysis.

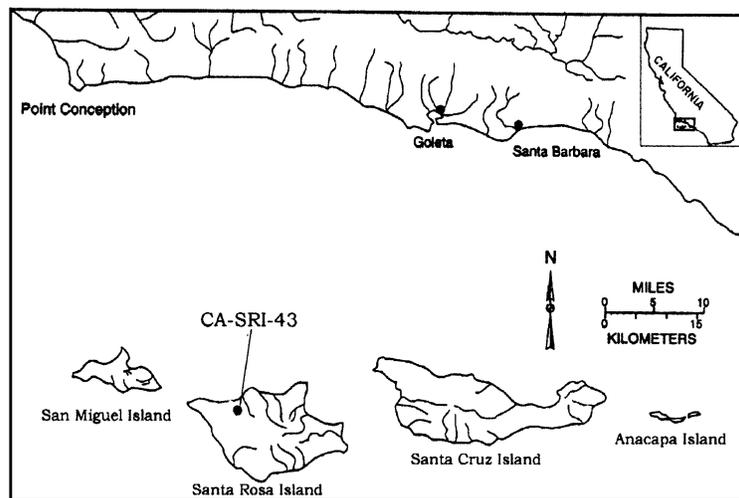


Figure 1 Location of CA-SRI-43 and Santa Rosa Island

Table 1 Radiocarbon dates for CA-SRI-43<sup>a</sup>

Material	Lab nr	Provenience	$^{13}\text{C}/^{12}\text{C}$ meas.	Uncor- rected $^{14}\text{C}$ age	$^{13}\text{C}/^{12}\text{C}$ adjusted	Age range (cal BP, $1\sigma$ )
Shell Fishhook	OS-26072	Sq. 16M, L. 5	+0.59	—	$1220 \pm 35$	630 (560) 530
Mixed shell	UCLA-105 <sup>b</sup>	Cemetery A: 9–12 in (23–31 cm)	N/A	$4790 \pm 90^b$	$5220 \pm 90$	5460 (5310) 5260
Red abalone	L-446B	14 M: 18–24 in (46–61 cm)	N/A	$5370 \pm 150$	$5800 \pm 150$	6160 (5930) 5770

<sup>a</sup>All dates were calibrated using Calib 4.3 (Stuiver and Reimer 1993, 2000). A  $\Delta R$  of  $225 \pm 35$  yr was used for all shell samples, and  $^{13}\text{C}/^{12}\text{C}$  ratios were either determined by the  $^{14}\text{C}$  labs, or an average of +430 yr was applied (Erlandson 1988).

<sup>b</sup>This date was reported as  $4800 \pm 100$  BP by Orr (1968:187), but review of the laboratory records indicate that it actually dates to  $4790 \pm 90$  BP (Fergusson and Libby 1962:110). Records at the SBMNH also list L-446a as the laboratory number.

## METHODS

The broken tip of a 1.2 cm long, burned mussel shell hook was selected for dating (Figure 2). A 50 mg fragment of the fishhook was removed from the larger specimen and sent to the National Oceanic Sciences AMS (NOSAMS) facility at Woods Hole Oceanographic Institute (WHOI) for analysis. The specimen was etched in dilute hydrochloric acid and rinsed in distilled water to remove any

contaminants. It was then dried and converted to CO<sub>2</sub> by reaction with 85% phosphoric acid under vacuum. Some of the specimen was then used to measure the <sup>13</sup>C/<sup>12</sup>C stable isotope ratio while the rest was converted to graphite before being sent to the Center for Accelerator Mass Spectrometry (CAMS) at the Lawrence Livermore National Laboratory.

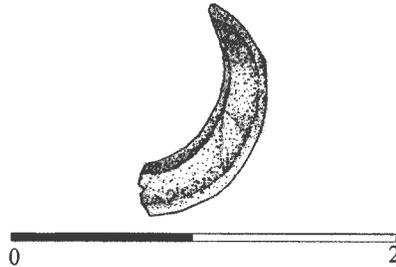


Figure 2 CA-SRI-43 fishhook specimen at 2×.  
(Drafted by Deana Dartt).

## RESULTS AND DISCUSSION

The AMS analysis of the shell fishhook produced a <sup>13</sup>C/<sup>12</sup>C corrected age of 1220 ± 35 BP (OS-26072). Calibration of this date using CALIB 4.3 (Stuiver and Reimer 1993, 2000) and a ΔR of 225 ± 35, yielded an intercept of 560 cal BP (AD 1390) and a range of 630 to 530 cal BP (AD 1320–1420) at one standard deviation. This date corresponds with King's (1990:28) Late Period (AD 1150–1804), rather than the Middle Holocene age asserted by Orr. It also demonstrates that CA-SRI-43 contains at least two occupations, one at about 5500 cal BP and another at roughly 560 cal BP.

These findings support earlier claims made by Glassow (1997:153) that CA-SRI-43 contained both Late and Middle Holocene cultural deposits, with many of the artifacts (i.e., fishhooks, microblades, etc.) probably associated with the later occupation. Interestingly, both of Orr's dates were obtained from the lower half of the site deposits, leaving the upper 23 cm undated. It is likely that the shell fishhooks, microblades, and many of the beads come from the undated upper portions of the site, or from an intrusive burial or other feature not noted during excavation. Unfortunately, due to the limited provenience and field notes for the CA-SRI-43 assemblage further excavation is necessary to test these assertions.

Strudwick (1985:60–1, 1986:271–2, 279) argued that the single-piece fishhook may have first appeared in southern California roughly 5000 yr ago or earlier, an estimate based partly on the specimens from CA-SRI-43. The revised age of the CA-SRI-43 fishhook, however, follows the general chronological trend for these artifacts noted by Glassow (1996:134), King (1990:83), Strudwick (1985:58–9) and others, which suggests most hooks date after about 2500 years ago. Recent dates directly on shell fishhooks (Koerper et al. 1988, 1995; Salls 1988), and fishhook age estimates based on associated <sup>14</sup>C dates (Raab et al. 1995:14; Vellanoweth and Erlandson 1999:268), suggest that the earliest shell fishhooks may have first appeared in the region at roughly 3000–3500 cal BP. This is about 2000 years later than Orr (1968), Strudwick (1985:60–1, 1986:272, 279), and others have suggested. The research presented here provides an important cautionary tale, demonstrating that more shell fishhooks and other artifacts need to be directly AMS dated to securely identify their chronology and document potential site disturbances. Following the work of Koerper et al. (1995), Vellanoweth (2001), and others, I argue that systematic AMS <sup>14</sup>C dating of individual artifacts should be used as a strategy to refine artifact, site, and regional chronologies.

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