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Style, Context, and Chronology of a Wooden Canoe Model from Santa Rosa Island, California

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In 1948, Phil Orr found a wooden canoe model eroding from a large multicomponent site (CA-SRI-6) on Santa Rosa Island, California. Orr was never able to accurately date this unique and rare artifact, but his descriptions suggest that this canoe model could have dated between roughly 9700 and 1200 cal BP. Accelerator Mass Spectrometry (AMS) dating of two wooden splinters from the artifact—the only directly dated canoe model in North America—yielded intercepts of 840 and 600 cal BP. Our direct dating of this model canoe provides additional

details on the chronology of Native American watercraft, illustrating the importance of using direct AMS dating of individual artifacts to refine the chronology of watercraft and other innovations.

In the Americas, indirect evidence of watercraft has recently been extended to roughly 13,000 to 11,000 calendar years ago (Erlandson 2002; Erlandson et al. 1996; Johnson et al. 2002). It remains unclear, however, what types of watercraft early peoples used and how these relate to boats described in ethnohistoric and ethnographic sources. North American coastal peoples used a variety of boats, including dugout and plank canoes, tule rafts, and skin boats (Gould 2000; Hudson and Blackburn 1982). The plank canoe, used by Chumash and Tongva (Gabrielino) peoples in southern California by at least 1,500 years ago, is one of the best known forms of ancient watercraft in the Americas (Arnold 1995, 2001; Cunningham 1989; Gamble 2002a; Hudson et al. 1978). However, boats are rarely preserved or found archaeologically, and direct radiocarbon dates on ancient North American watercraft are extremely limited, making it difficult to determine the timing of key watercraft innovations (see Gamble 2002a).

In this paper, we present Accelerator Mass Spectrometry (AMS) dates from a wooden canoe model collected at CA-SRI-6 by Phil Orr (1951, 1968) on Santa Rosa Island, California (Figure 1). This is one of the few wooden canoe models obtained from the Pacific Coast of the Americas (Gould 2000; Hudson and Blackburn 1986), but its provenience is relatively limited and the few descriptions available made it unclear whether this artifact dated to the Early, Middle, or Late Holocene deposits documented at the site (see Erlandson et al. 1999). We discuss the results of our AMS project, describe the style and context of this important artifact, and place our find in the realm of other recent watercraft discoveries in North America. Our experience in dating the model canoe also provides important lessons about the rapidly expanding efforts to refine the chronology of key technological and other cultural developments through AMS dating of small samples from individual artifacts.

STYLE AND CONTEXT OF THE CA-SRI-6 MODEL CANOE

Phil Orr (1951, 1968:145-146) of the Santa Barbara Museum of Natural History (SBMNH) collected the canoe model in 1948 at CA-SRI-6, near the mouth of Arlington Canyon. Stone canoe effigies are relatively common in the region (Gamble 2002a), but the wooden model recovered by Orr is unique. Of ten model canoes described by Hudson and Blackburn (1986:181-182), only three are made of wood, including the Arlington canoe. One of these may be modern (see Hudson and Blackburn 1986: 181), and another effigy collected by Schumacher in 1878 has extremely limited provenience. A catalog of artifacts at the Smithsonian Institution suggests that the Schumacher collection contains at least

two other canoe models, but these have never been adequately described or analyzed. Hudson and Blackburn (1986:182) also describe an additional wooden artifact from San Clemente Island as a probable canoe model. We caution that some of the canoe models are fakes made by collectors using metal tools, and without careful analysis it is difficult to determine the authenticity of some of these artifacts (Gamble 2002b).

The Arlington boat, currently housed at the SBMNH (catalog #NA-CA-131.6-10E-1; 3559) and carved from a single piece of conifer wood, is roughly 165 mm long, 43.5 mm wide, 27.8 mm thick, and weighs 34.5 g (Figure 2). It was discovered at a depth of approximately 2.5 m in an erosional exposure; half its length was exposed and weathered by the elements. The

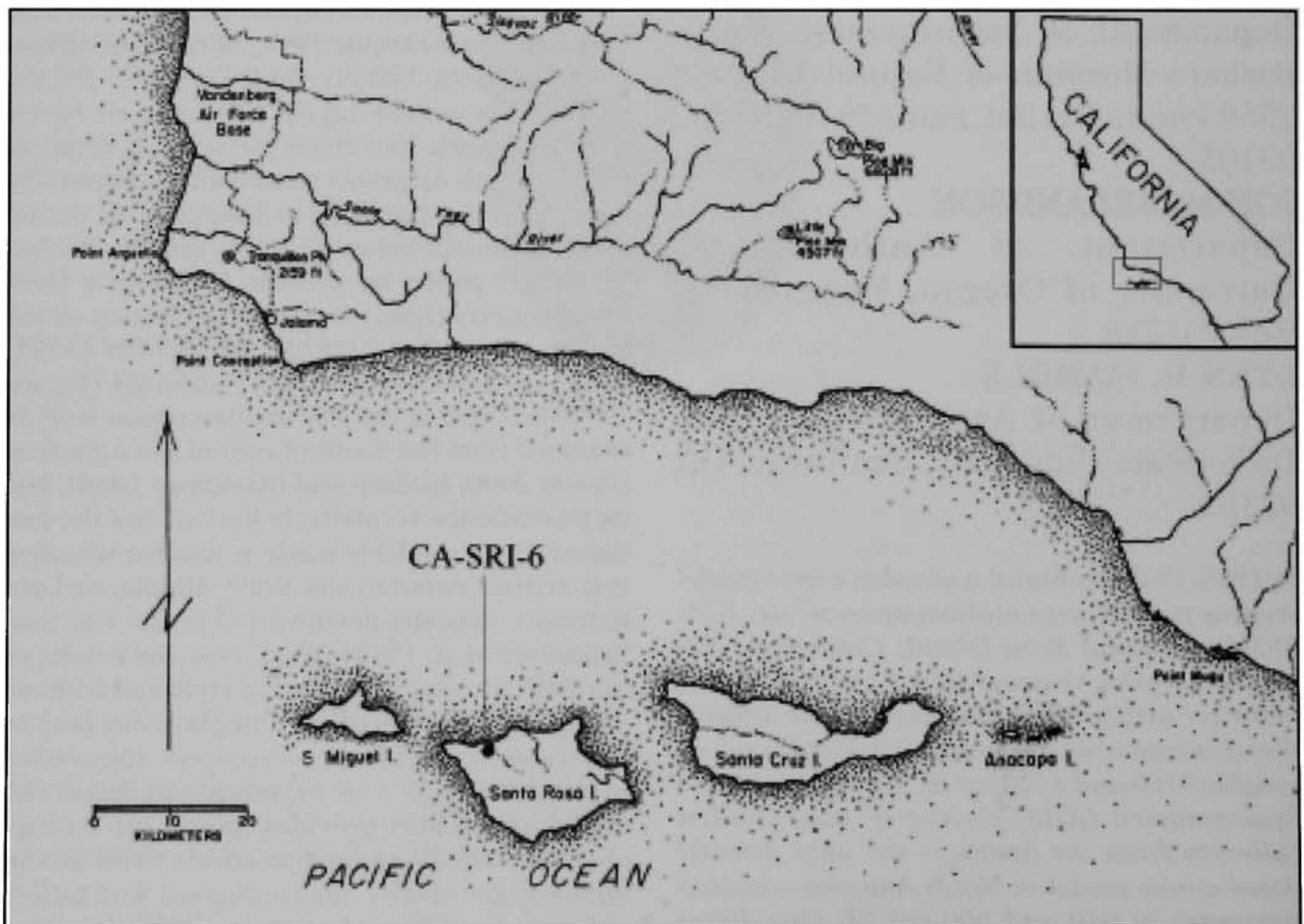


Figure 1. CA-SRI-6 and the Santa Barbara Channel.



Figure 2. Wooden Canoe Model from Santa Rosa Island.

beginnings of lichen growth are apparent on the exposed portion of the boat. Although it is difficult to determine the type of boat represented by this effigy, the high bow of the model canoe is similar to that of plank canoes and tule boats documented in the region.

CA-SRI-6 is a large site situated on a roughly 20 m high eroding marine terrace. A series of stratified archaeological deposits extend from a depth of 10 m to the site surface; they have been dated between roughly 9730 and 1260 cal BP (Erlandson et al. 1999; Table 1). Orr recovered the canoe model while traversing gullies and exposures, but the precise location and association are unclear (Orr 1951; 1968:145-146). Many of the site deposits are discontinuous or slope steeply across the sea cliff, but our best estimate is that it came from the surface near a sand mound about 2.5 m below the top of the terrace. Orr (1951) suspected the canoe model dated to within the last 3,000 years and was made by Chumash "Canaliño" peoples. Nonetheless, until recently the artifact had never been directly dated, and a depth of 2.5 m could make the find (depending on its horizontal location) anywhere from about 9730 to 1260 years old.

ANALYTICAL PROCEDURES AND DATING

We obtained three splinters of wood from the bottom of the canoe for AMS dating. Because contamination of the sample was of great concern, we checked museum records to see if the boat had been treated with chemicals that could affect its radiocarbon age. The artifact was

also thoroughly inspected for signs of contamination like asphaltum (bitumen) that could yield an anomalous date. We found no evidence of contamination that would produce an unreliable ^{14}C date. The museum cabinets had at one time been treated with the pesticide Vapona, but unless exposure was severe, it should not impair radiocarbon dating. A small portion of the artifact had been inked with the catalog number, but this was well away from the area we sampled. Some lichen is present on the portion of the boat exposed before its discovery, but we carefully avoided this area in obtaining ^{14}C samples.

On two separate occasions, we removed the ^{14}C samples from the unweathered portions of the underside of the boat using a sterile blade. Each wooden splinter was placed in a sealed plastic bag, stored at room temperature, and sent to the National Ocean Sciences AMS (NOSAMS) Facility at Woods Hole Oceanographic Institute. (Additional sample pretreatment and dating procedures are available at <http://www.whoi.nosams.edu>.) Our first sample produced an erroneous Early Holocene (8770 ± 45 RYBP) date, later determined to be the result of a faulty CN-analyzer used to combust the sample. By this time, we had collected second and third samples, having shaved away portions of the exterior of the boat to obtain samples that were deeper and less susceptible to contamination. The second sample, obtained using a closed tube combustor, yielded a date of 915 ± 30 RYBP (OS-34790), with a calibrated intercept of 840 cal BP. The third sample, also obtained using a closed-tube combustor, provided a date of 650 ± 30 RYBP (OS-35592) and a calibrated intercept of 600 cal BP.

According to NOSAMS, both the second and third dates are reliable, and the error between the two likely represents variability within the wood or pretreatment procedures. Perhaps the best estimate of the age of this boat is an average of the second and third dates. Averaging these dates using CALIB 4.3 provides an estimated age of 785 ± 21 RYBP, a calibrated intercept of 690 cal BP, and a 2 sigma range of 730 to 670 cal BP. The average of these dates roughly corresponds

Table 1
A RADIOCARBON CHRONOLOGY FOR CA-SRI-6 AND CANOE MODEL.

Depth (Below Surface)	Sample #	Material	Uncorrected Radiocarbon Age	¹³ C/ ¹² C Adjusted Age	Calibrated Age Range BP (2 Sigma)
2.4-3 m	OS-35592	Wood/canoe sample 3	-	650 ± 30	670 (600) 550*
2.4-3 m	OS-34790	Wood/canoe sample 2	-	915 ± 30	930 (840) 740*
0.2-0.3 m	Beta-119882	California mussel	1490 ± 80	1930 ± 80	1410 (1260) 1070
3.65 m	L-257	Red abalone	6820 ± 160	7260 ± 160	7820 (7520) 7240*
?	Beta-47818	Black abalone	7090 ± 90	7530 ± 90	7950 (7750) 7580
4.57	LJ-27	Red abalone	7440 ± 200	7880 ± 200	8520 (8110) 7690
7 m	Beta 47625	Red abalone	8360 ± 80	8800 ± 80	9730 (9000) 8870

All dates were calibrated using Calib 4.3 (Stuiver and Reimer 1993, 2000), and applying a DR of 225 ± 35 years for all shell samples (Kennett et al. 1997). ¹³C/¹²C ratios were either determined by the radiocarbon labs, or an average of ±430 years was applied. * denotes samples with multiple intercepts. The average is provided.

with the beginning of King's (1990) Late Period, but is about 500 years younger than other dates obtained from CA-SRI-6 (see Table 1). Thus, a Late Period component may exist somewhere at this large and complex site.

DISCUSSION AND CONCLUSIONS

The antiquity of seafaring in the Channel Islands is now known to span roughly 12,000 to 13,000 years, but we still know relatively little about the development of such watercraft. Because of the rich ethnographic descriptions of plank canoes (*tomols*) and their association with maritime voyaging, interaction, and exchange, archaeologists have long focused on determining the antiquity of this boat type (see Arnold 1995, 2001; Davenport et al. 1993; Gamble 2002a). Current evidence suggests that plank canoes probably emerged within the last 2,000 to 1,000 years (Arnold 2001:14; Bernard 2001; Davenport et al. 1993; Gamble 2002a). However, the presence of people on offshore islands and evidence of marine mammal hunting and fishing suggests that efficient predecessors were around for several millennia earlier

(Erlandson et al. 1996; Johnson et al. 2002; Porcasi and Andrews 2001; Porcasi and Fujita 2000; Raab and Yatsko 1991; Rick et al. 2001). Heizer (1940), Hudson et al. (1978), and others speculated that the predecessors of the plank canoe may have been modified dugouts or emulations of tule boats with similar high prow and stern. Unfortunately, it is often difficult to determine if a canoe model represents a plank canoe, dugout, tule boat, or other type of watercraft (Gamble 2002a).

As Gamble (2002a) has noted, model canoes, along with canoe planks, boat drills, and asphaltum, are a significant component of understanding boat style, chronology, and production techniques. Model canoes are important symbolic artifacts that reflect an affinity and appreciation for maritime voyaging and may have functioned as charms (Hudson et al. 1978:126), toys, or heuristic devices for teaching children about the ocean (Rogers 1929:378). Because so many of these model canoes are museum specimens with limited provenience, it is difficult to estimate their antiquity and chronology. Except for the CA-SRI-6 specimen, and a few other models collected in

the late 19th and early 20th centuries, most canoe models are made of stone and cannot be directly dated (Gamble 2002a; Hudson and Blackburn 1986). The oldest stone canoe effigy is currently from CA-SRI-154, associated with artifacts believed to date between about A.D. 400 and 700 (Gamble 2002a). Two additional specimens from CA-SBI-11 and CA-SBI-3 on Santa Barbara Island appear to be the ends of carved steatite boat effigies, but could also be scoops (Rozaire 1978:21, 81). CA-SBI-11 has not been ¹⁴C dated, but a single ¹⁴C date from CA-SBI-3 ranges between 1350 to 1160 cal BP (Erlandson et al. 1992), roughly corresponding with Gamble's (2002a) estimate for the specimen from CA-SRI-154.

Elsewhere in North America, model canoes appear to be extremely rare. A few model/toy umiaks and kayaks from the Bering Strait are probably of late prehistoric age, and a miniature reed boat from Peru may be about 2000 years old (Gould 2000:94, 96). However, to our knowledge the Arlington boat is currently the only North American canoe model that has been directly dated. Full size watercraft are also rare and are generally recovered only from wet sites. Among the most well-dated and ancient North American watercraft are numerous canoes recovered from peat deposits in Florida, dated to as early as about 6000 RYBP (McGee 2001). Other watercraft that have been recovered in the Americas are thought to be fairly recent in age (see Gould 2000), but there are relatively few specimens that are well described or dated.

The dating of the Arlington canoe model provides further evidence for the importance of direct AMS dating of individual artifacts to refine artifact, site, and regional chronologies. The dating of the canoe model, however, demonstrates the need to remain conservative and cautious when collecting and submitting ¹⁴C samples and interpreting radiocarbon dates. The Early Holocene age originally obtained is an obvious example, but the roughly 200 year discrepancy between the second and third samples suggests that even specimens obtained from the same location on an artifact can yield fairly divergent results. We argue that

researchers should obtain multiple radiocarbon dates, on different types of materials if possible, and continue to correlate artifact chronologies using seriation and other relative dating means. We hope archaeologists will continue to use AMS dating as a method for building the chronology of key artifact types, and in particular specimens from museums collected over the last century or so.

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