Trade and Exchange on the Newport Coast, Orange County, California

Roger D. Mason

Abstract

Several materials from outside coastal Orange County were identified in sites investigated for the Newport Coast Archaeological Project (NCAP). The materials include shell beads from the Chumash region (Santa Barbara Channel area), obsidian from the east side of the Sierra Nevada Mountains and from the south end of the Salton Sea, fused shale from Ventura County, and jasper, most or all of which derived from the local Santa Ana Mountains. During the Late Prehistoric period *Olivella* shell beads made in the Chumash area were traded into the Newport Coast area. However, there is the possibility of local shell bead manufacture during the Milling Stone period. Obsidian from both the Coso and Obsidian Butte sources was present in both the Milling Stone and Late Prehistoric periods. It was previously thought that Obsidian Butte obsidian was not present in Orange County during the Milling Stone period.

Introduction

The Newport Coast Archaeological Project (NCAP) provided a unique opportunity to study coastal settlement systems on a regional scale. The project's 37 sites, located in Orange County's San Joaquin Hills and along the adjacent coast (Figure 1), were investigated using the same research design (Mason 1991) and field and analytic methods. The project began in 1988, and during the following five years, hundreds of units were excavated. Recovered materials were sorted and cataloged using a coding system. The coded data from over 1,700 m^3 of excavated materials were entered into a database, proofed, and computer verified. The resulting database contains over 200,000 records and was used to generate the data discussed in this article. The NCAP was a data recovery program to mitigate the impact on cultural resources from development of the Newport Coast Planned Community (NCPC). The NCAP was funded by Coastal Community Builders, a division of The Irvine Company.

The NCPC was developed within a tract of land about 4.5 square miles in an area which extends from the Pacific Ocean to Signal Peak, a high point within the San Joaquin Hills with an elevation of 355 m asl (1,165 ft) (Figure 1). Topography includes marine terraces along the ocean coast, Pelican Hill which rises steeply above the marine terraces reaching an elevation of 217 m asl (711 ft), and a series of ridges and steep canyons located further inland in the San Joaquin Hills. Two of these canyons, Buck Gully and Los Trancos Canyon, are major drainages within the tract that extend from the flanks of Signal Peak to the ocean. The sites on the marine terraces were occupied during the Milling Stone period (8000–3000 BP). Most of these sites were occupied during the Milling Stone 2 subperiod (5800–4650 BP). The sites on the hills and ridges and in the canyons were mostly occupied during the Late Prehistoric period (1350–200 BP). The NCAP project area appears not to have been occupied during the Intermediate period (3000–1350 BP). The NCAP chronology uses chronological units developed by Wallace (1955) and later applied to Orange County by Koerper and Drover (1983). The NCAP chronology is based on a frequency distribution of the 300 calibrated radiocarbon dates (Mason and Peterson 1994).

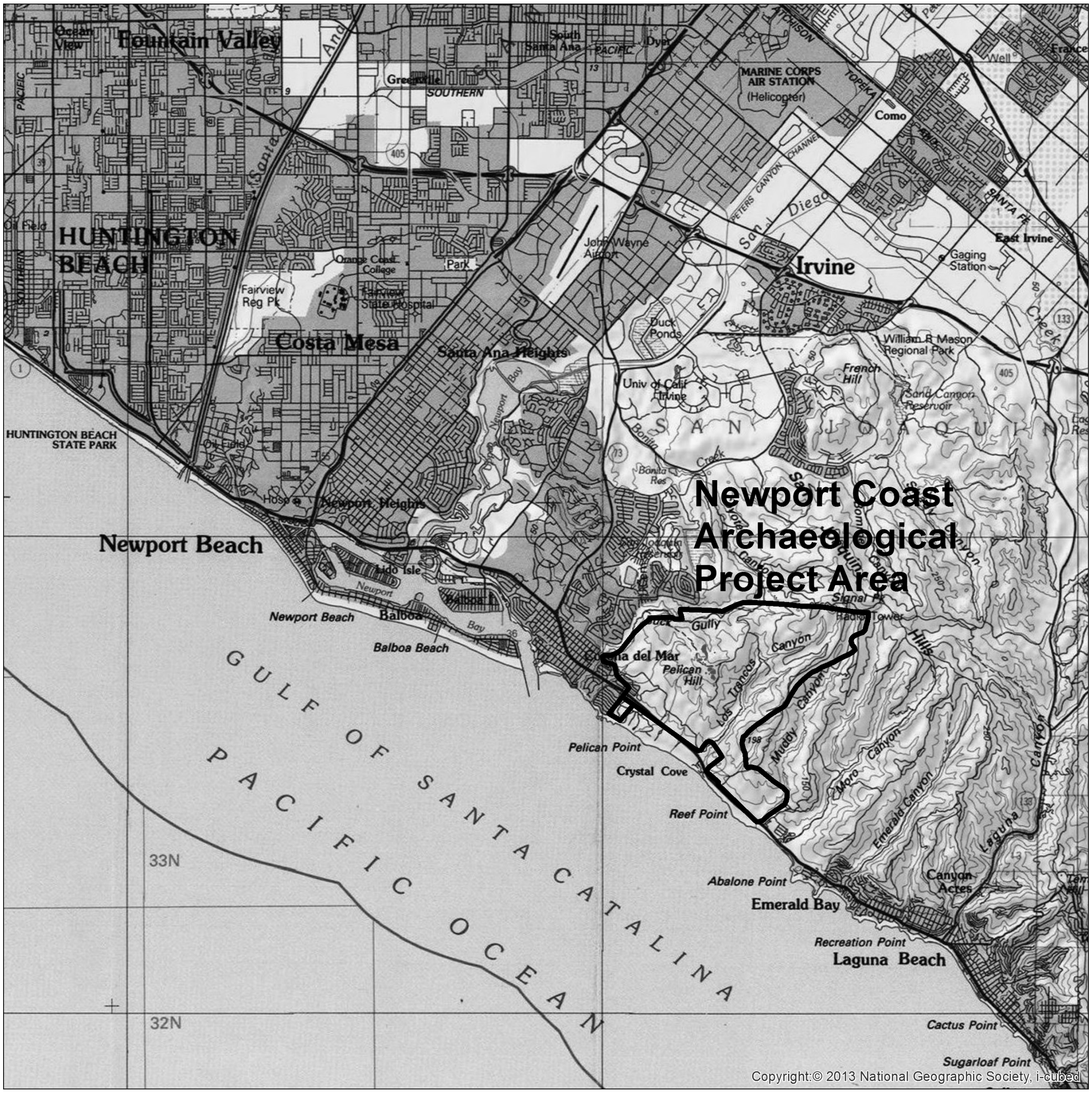

Figure 1. Location of the Newport Coast Archaeological Project (NCAP).

Two site types, residential bases and locations, were defined for the Milling Stone period. The Milling Stone period residential bases were occupied during a single season, the summer. During the Late Prehistoric period there were major residential bases, minor residential bases, and specialized activity loci. The Late Prehistoric major residential bases were multi-seasonal and may have been unoccupied only during the winter (Mason and Peterson 1994).

Several materials were identified in the NCAP sites that came from outside coastal Orange County. These include shell beads from the Chumash region (Santa Barbara Channel area), obsidian from the east side of the Sierra Nevada Mountains and from the south end of the Salton Sea, fused shale from Ventura County, and jasper from the Santa Ana Mountains and possibly from the Mojave Desert and/or the Colorado Desert.

Beads and Ornaments

Over 1,100 shell beads and ornaments were recovered from the analyzed components (material from a specific occupation within a site) of the NCAP sites and were submitted to Robert O. Gibson for identification and analysis. About 85 percent of the beads and ornaments could be classified by time period. Of the number of beads identified by Gibson, 15 percent were from the Early Period, 15 percent were from the Middle Period, and 70 percent were from the Late Period as defined in the Santa Barbara Channel area (King 1990). The Milling Stone period in the Orange County area (which ended ca. 3000 BP) is roughly equivalent to the Early Period in the Santa Barbara Channel area. Based on radiocarbon dating, the Intermediate period (3000–1350 BP) is not represented in the NCAP sites. The Intermediate period is roughly equivalent to the very late part of the Early Period and the early part of the Middle Period in the Santa Barbara Channel area. The Late Prehistoric period in Orange County is roughly equivalent to the late part of the Middle Period and the Late Period. The dramatic increase in number of beads during the Late Prehistoric period compared to the Milling Stone period suggests that trade and exchange were much more important during Late Prehistoric times. *Olivella* callus beads likely served as valuables (Earle 1982) to facilitate the exchange of resources among the semi-sedentary, territorial groups which are thought to be characteristic of the Late Prehistoric period.

There is no evidence for *Olivella* shell bead manufacture at Late Prehistoric NCAP sites, and the same bead types found in the Santa Barbara Channel area occur in the NCAP sites. Gibson and King (1994) believe this indicates that Late Prehistoric period *Olivella* shell beads from Late Prehistoric period NCAP sites were produced and "exported" from the Santa Barbara Channel area where robust evidence of *Olivella* shell bead manufacture has been found on Santa Cruz Island. Although it appears shell beads were not made in the NCAP area during the Late Prehistoric period, there is some evidence for local bead manufacture during the Milling Stone period.

The distribution of beads and ornaments among the Late Prehistoric site types shows they are almost entirely confined to major residential bases. Of the 738 beads and ornaments from Late Prehistoric components, 293 came from CA-ORA-662 Area 3 East (see Mason 2008), and 172 came from the upper component of CA-ORA-672. Both of these major residential base components contained cremations, although at ORA-672 only nine beads were associated with the cremation feature. At ORA-662 Area 3 East most beads came from the cremation area (Feature 28) and a nearby fire-affected rock feature with dense residential refuse (Feature 18) (see Mason 2008). Significant numbers of *Mytilus* (mussel) disc beads were found in Features 18 and 28 at ORA-662 Area 3 East and at ORA-672. *Mytilus* disc beads indicated higher social status in the Chumash area according to King (1990:61, 63), and that could have been the case at ORA-662 Area 3 East and ORA-672. Most of the other Late Prehistoric shell beads were *Olivella* callus disc beads, which in the Chumash area functioned as valuables in exchanges between individuals (King 1990).

Of the 116 beads and ornaments recovered from Milling Stone period components, 106 came from CA-ORA-667, CA-ORA-928, and CA-ORA-929, all classified as residential bases. There is some evidence for bead manufacture at CA-ORA-340 and ORA-929. Although ORA-340 was also occupied during the Late Prehistoric period, Gibson and King (1994:7) believe the evidence for bead manufacture at ORA-340 and ORA-929 belongs to the Milling Stone period occupation. The bead manufacturing technique indicated by the bead debris (fragments of *Olivella* shells with evidence of human modification) involved spire tapping, and the callus part of the shell was present on several of the fragments. This suggests *Olivella* wall discs and rectangles were being made. This manufacturing technique and these bead types are characteristic of the Early Period in the Chumash area (Milling Stone period in Orange County). There is also evidence for manufacture of *Megathura* (limpet) rings at five NCAP sites that date to the late Middle period (early part of the Late Prehistoric period). Some *Haliotis* (abalone) ornaments and stone beads appear to have been made locally in both the Milling Stone and Late Prehistoric periods (Gibson and King 1994:7).

Evidence of an interaction sphere during the Milling Stone period that excluded the Santa Barbara Channel area is provided by the distribution of *Olivella* grooved rectangle beads. Five of these beads were found at ORA-667, an NCAP Milling Stone period residential base, and one came from CA-ORA-665, another NCAP Milling Stone period residential base. Elsewhere, they have been found in the Bolsa Chica area of Orange County (CA-ORA-368), and on Santa Catalina, San Clemente, and San Nicholas islands (Howard and Raab 1993). However, only one grooved rectangle bead has been found in the Santa Barbara Channel area. Howard and Raab (1993) suggest that this distribution of *Olivella* grooved rectangle beads indicates an interaction sphere among the southern Channel Islands and the Orange County coast around 6000 BP, based on calibrated dates from San Clemente Island. The oldest calibrated dates from the two NCAP sites where grooved rectangle beads were found are around 5600 BP. Whatever the actual date, the distribution of *Olivella* grooved rectangle beads does suggest interaction, possibly in the form of trade and exchange between the Orange County coast and the southern Channel Islands during the Milling Stone period.

Obsidian

Obsidian is a desirable material for flaked stone tool production because it is vitreous, thus easily flaked to produce a sharp edge. Obsidian comprises .2 percent (141 pieces) of the analyzed debitage sample from the Milling Stone period components and .4 percent (193 pieces) of the analyzed debitage sample from the Late Prehistoric period. A total of 1,442 pieces of obsidian (tools and debitage) were identified, 432 from Milling Stone period components and 1,010 from Late Prehistoric period components. Even though there are more Late Prehistoric period components than Milling Stone period components, there still appears to be an increase in the amount of obsidian attributable to the Late Prehistoric period. The distribution of obsidian by artifact type for the Milling Stone period and Late Prehistoric period is shown in Table 1.

The small number of decortication flakes from Milling Stone period components indicates obsidian probably entered the NCAP area after initial stages of reduction had been completed elsewhere. The absence of cores suggests that all obsidian pieces of sufficient size were used for tools; nothing was wasted.

During the Late Prehistoric period, the proportion of bifaces and biface thinning flakes increased compared to the Milling Stone period. There is a slightly higher proportion of decortication flakes, and one core indicates that obsidian in larger, less-reduced pieces was somewhat easier to obtain. This is also indicated by the greater number of tools made from obsidian flakes.

Hydration measurements and source determinations using neutron activation analysis of obsidian debitage were carried out by Dr. Jonathon E. Ericson (1994). The sources of 33 pieces of obsidian debitage from Milling Stone period components were determined. Of these, 25 pieces are from the Coso source, two are from the Casa Diablo source, and six are from the Obsidian Butte source. That a significant proportion (18 percent) of the Milling Stone period obsidian debitage is from the Obsidian Butte source is unexpected. Previous studies of obsidian from Orange County sites (Koerper et al. 1986; Ericson et al. 1989) indicated

Table 1. Distribution of Obsidian by Artifact Type and Period.

Artifact Type	Milling Stone		Late Prehistoric	
	Number	Percent	Number	Percent
Tertiary Flake	387	90	772	76
Biface Thinning Flake	33	8	170	17
Bifaces	5	1	27	3
Decortication Flakes	2	0.5	18	2
Unidentified Debitage	0	0	1	0.1
Biface Preform	2	0.5	6	0.6
Retouched Flake	1	0.2	5	0.5
Utilized Flake Scraper	0	0	4	0.4
Drill	1	0.2	3	0.3
Perforator	0	0	3	0.3
Knife	1	0.2	0	0
Flake Knife	0	0	0	0
Core	0	0	1	0.1
Total	432		1010	

that obsidian from Obsidian Butte did not appear in Orange County until the Late Prehistoric period and that hydration measurements for Obsidian Butte obsidian should be less than 2.5 microns (μ). One hydration measurement from an Obsidian Butte sample from CA-ORA-660 (a Milling Stone period site) was 6.0 μ, and the measurement from an Obsidian Butte sample from ORA-340 (which has a late Milling Stone period radiocarbon date) was 7.8 μ. This suggests that the Obsidian Butte source was accessible due to a lowering of the water level in Lake Cahuilla (now the Salton Sea) during the Milling Stone period, as well as during the Late Prehistoric period. The mean hydration measurement for Coso obsidian from Milling Stone period components is 6.6 μ with a range from 3.5 μ to 9.0 μ (n = 9).

Source analysis of obsidian debitage from Late Prehistoric components shows that 22 pieces are from the Coso source, five are from the Casa Diablo source, and 32 are from the Obsidian Butte source. The average hydration measurement for Coso source specimens is 3.7 μ with a range from less than 1 μ to 9.7 μ (n = 14). The thickest measurements are from CA-ORA-673 where they are similar to measurements from Milling Stone period samples. The average hydration measurement for Obsidian Butte obsidian is 2.8 μ with a range from less than 1μ to 4.2 μ (n = 15). The range of hydration measurements overlap, providing little evidence for a hiatus between the end of availability of Coso obsidian and the beginning of availability of Obsidian Butte obsidian. Also of interest is the variation of obsidian sources with site type during the Late Prehistoric period. The distribution is shown in Table 2.

These data suggest that most obsidian used in major residential bases was from the Coso source, while most obsidian used in minor residential bases and specialized activity loci was from Obsidian Butte. As a check on the data from the obsidian debitage, large and small projectile points were submitted for sourcing using X-ray fluorescence analysis. It was assumed that the small arrow points were from the Late

Table 2. Obsidian Sources by Site Type During the Late Prehistoric Period.

	Coso	Casa Diablo	Obsidian Butte
Major Residential Bases	16	5	7
Minor Residential Bases	2	0	5
Specialized Activity Loci	4	0	20
Total	22	5	32

Prehistoric period and that the larger dart points were from earlier periods, although it is possible they may have overlapped in time. Five of six small points were made of Obsidian Butte obsidian, and one was Coso obsidian. All the small points came from Late Prehistoric components. Two large points from CA-ORA-662, a Late Prehistoric major residential base, and three large points from Milling Stone period components were made of Coso obsidian. This suggests that some of the debitage from the Coso source in Late Prehistoric major residential bases may be from making dart points during earlier brief occupations of these sites or during the early part of the Late Prehistoric period when dart points may still have been in use. Possible earlier occupations at ORA-662 are suggested by a few radiocarbon dates, and earlier occupations at CA-ORA-671 and ORA-672 are suggested by a few shell beads. The specialized activity loci appear to have been used only during the Late Prehistoric period. The results of the obsidian studies suggest that obsidian exchange in coastal Orange County was more complex than has been suggested by Koerper et al. (1986) and Ericson et al. (1989). While Coso obsidian was predominant during the Milling Stone period, Obsidian Butte obsidian was also available. Coso and Obsidian Butte obsidians overlapped in availability during the Late Prehistoric period, but average hydration measurements suggest that availability of Coso obsidian peaked prior to the major use of Obsidian Butte obsidian. There is little evidence for a hiatus in the availability of obsidian during the early part of the Late Prehistoric period, however. That Obsidian Butte material was predominant during the Late Prehistoric period is indicated by the fact that five of the six arrow points sourced are made of Obsidian Butte obsidian.

Fused Shale

Fused Shale is a metamorphic rock that has become semivitreous as a result of heat and pressure. It may have been a substitute when obsidian was unavailable. Accordingly, it was hypothesized that fused shale would increase in frequency during the predicted hiatus in availability between Coso obsidian and Obsidian Butte obsidian during the early part of the Late Prehistoric period. However, as previously discussed, there is little evidence for this hiatus. Only 64 pieces of fused shale were recovered from the Milling Stone and Late Prehistoric NCAP components. There is little difference by time period; thirty-seven pieces came from Milling Stone period components, and 27 pieces came from Late Prehistoric components (Table 3).

The data in Table 3 support the inference that fused shale was used primarily to make bifaces (mostly dart points) prior to the Late Prehistoric period. The absence of decortication flakes and cores and the low numbers of biface thinning flakes and tertiary flakes suggest that fused shale came into the area as late stage preforms or finished points. It is likely that the fused shale found in NCAP sites came from Grimes Canyon in Ventura County (Clay Singer, personal communication 1992).

Table 3. Distribution of Fused Shale by Artifact Type and Period.

Artifact Type	Milling Stone		Late Prehistoric	
	Number	Percent	Number	Percent
Unidentified Debitage	23	62	9	33
Tertiary Flake	1	3	12	44
Biface Thinning Flake	3	8	2	7
Bifaces	7	19	4	15
Biface Preform	2	5	0	0
Utilized Flake Scraper	1	3	0	0
Total	37		27	

Jasper

A total of 785 pieces of jasper were recovered from the Milling Stone and Late Prehistoric NCAP components. Of the total, 523 pieces (60 percent) are from the Late Prehistoric period, and 262 (30 percent) are from the Milling Stone period. However, there are more Late Prehistoric period components than Milling Stone period components. In order to compare the relative amounts of jasper in the two time periods, the amount of jasper compared to the total amount of analyzed debitage can be calculated for each time period. Jasper comprises .13 percent of the analyzed debitage in both the Milling Stone and Late Prehistoric components, suggesting that the availability of jasper remained constant over thousands of years. Jasper occurred in lower frequencies than obsidian which comprised .2 to .4 percent of the analyzed debitage. The distribution of jasper is shown in Table 4.

The absence of cores and decortication flakes in the Milling Stone period suggests jasper may have arrived with the initial stages of reduction already completed or as biface preforms. The presence of cores, decortication flakes, and hammerstones made of jasper in the Late Prehistoric period indicates that jasper may have arrived in a less prepared form than in the Milling Stone period.

Based on the occurrence of jasper and jasper artifacts at the Tomato Springs site (CA-ORA-244) located at the east end of the Tustin Plain in Orange County, Cottrell (1985) stated that people from Tomato Springs went to jasper sources in the Mojave Desert (near Barstow) and in the Colorado Desert (near the Colorado River) and brought back large unmodified chunks of the material to Tomato Springs to make into artifacts for trade with other people in coastal southern California. This model was criticized by Koerper et al. (1987) based on current models of lithic procurement and trade at the tribal level, resource control, and tool manufacture. Cottrell and Wagner (1990) conducted a macroscopic and microscopic analysis of jasper from Tomato Springs and concluded that the jasper came from the Mojave Desert and/or Colorado Desert. Koerper et al. (1992) found that jasper can be obtained locally near Tomato Springs. The physical and chemical properties of the locally occurring jasper and the jasper debitage from ORA-244 are nearly identical. Thus, it appears that the jasper artifacts from Tomato Springs (ORA-244) were made from locally derived materials (Koerper et al. 1992). Jasper made up a similar proportion of the debitage in NCAP Milling Stone and Late Prehistoric components indicating it was available locally for thousands of years. The NCAP lithics analyst, Clay Singer (personal communication 1992), concluded that the chert and jasper material used to make the flaked stone artifacts found in NCAP

Table 4. Distribution of Jasper by Artifact Type and Period.

Artifact Type	Milling Stone		Late Prehistoric	
	Number	Percent	Number	Percent
Unidentified Debitage	155	59	403	77
Tertiary Flake	40	15	46	9
Biface Thinning Flake	60	23	41	8
Biface	3	1	15	3
Decortication Flake	0	0	1	0.2
Core Fragment	0	0	1	0.2
Core	0	0	6	1.1
Biface Preform	1	0.4	3	0.6
Retouched Flake	0	0	3	0.6
Retouched Flake Scraper	1	0.4	1	0.2
Reamer	0	0	1	0.2
Prismatic Blade	1	0.4	0	0
Microblade	1	0.4	0	0
Edge Ground Flake	0	0	0	0
Spherical Hammer	0	0	1	0.2
Angular Hammer	0	0	1	0.2
Total	262		523	

sites was found where it had eroded into local canyon stream beds in the San Joaquin Hills and Santa Ana Mountains. A chert source in the foothills of the Santa Ana Mountains along Aliso Creek is described by Van Horn (1986). Because the jasper artifacts found at Milling Stone period NCAP sites had already undergone the initial phases of reduction elsewhere, they may have come from the Santa Ana Mountains foothills where the initial phases of reduction took place.

Summary

The presence of beads, obsidian, fused shale, and jasper reflects that NCAP sites occupants participated in trade and exchange networks in both the Milling Stone and Late Prehistoric periods. The bead data indicates the possibility of local shell bead manufacture during the Milling Stone period. The presence of grooved rectangle beads on the Orange County coast and on the southern Channel Islands suggests an interaction sphere linking these areas around 5600 BP. The great increase in bead quantity and lack of evidence for local manufacture during the Late Prehistoric period indicates participation in an exchange network where beads served as valuables.

The obsidian data did not confirm the expected distribution of Coso and Obsidian Butte material. Volcanic glass from both sources is present in each time period. However, most small obsidian projectile points analyzed were made from Obsidian Butte material. Hydration measurements are in the predicted range (greater than 4.5 μ) for obsidian from both sources during the Milling Stone period. The hydration measurement ranges overlap during the Late Prehistoric period, indicating there may have been no hiatus in access to obsidian. There appears to have been an increase in the availability of obsidian during the Late Prehistoric period compared to the Milling Stone period.

Access to fused shale did not increase during the early part of the Late Prehistoric to compensate for the hypothesized decrease in obsidian. Fused shale was more common during the Milling Stone period and was used almost exclusively to make dart points. It may have been received as biface preforms.

Jasper occurred in lower frequencies than obsidian in both time periods. The small analyzed jasper sample suggests that more of the initial stages of reduction were carried out locally during the Late Prehistoric period.

Acknowledgments

The Newport Coast Archaeological Project was funded by The Irvine Company. I appreciate the comments of two anonymous reviewers.

References Cited

Cottrell, Marie G.
1985 Tomato Springs: The Identification of a Jasper Trade and Production Center in Southern California. *American Antiquity* 50(4):833–849.

Cottrell, Marie G., and Hugh M. Wagner
1990 Tomato Springs: Additional Research Results. *Pacific Coast Archaeological Society Quarterly* 26(1):17–22.

Earle, Timothy
1982 The Ecology and Politics of Primitive Valuables. In *Culture and Ecology: Eclectic Perspectives*, edited by J. Kennedy and R. Edgerton, pp. 65–83. American Anthropological Association Special Publication 15. Washington, D.C.

Ericson, Jonathon E.
1994 Appendix D: Prehistoric Exchange of Obsidian for Sites of the Newport Coast Archaeological Project: Results of Source Characterization and Hydration Measurements. In *Newport Coast Archaeological Project: Newport Coast Settlement Systems, Analysis and Discussion, Volume II: Technical Appendices.* Report prepared for Coastal Community Builders, a division of The Irvine Company, Newport Beach. Report prepared by The Keith Companies, Costa Mesa. On file, South Central Coastal Archaeological Information Center, California State University, Fullerton.

Ericson, Jonathon E., Henry C. Koerper, Christopher E. Drover, and Paul E. Langenwalter II
1989 Advances in Obsidian Hydration Dating and Obsidian Exchange in Prehistoric Orange County. *Pacific Coast Archaeological Society Quarterly* 25(2):45–60.

Gibson, Robert O., and Chester D. King
1994 Appendix B: Analysis of Beads, Ornaments, and Fishhooks from 25 Orange County Sites. In *Newport Coast Archaeological Project: Newport Coast Settlement Systems, Analysis and Discussion, Volume II: Technical Appendices.* Report prepared for Coastal Community Builders, a division of The Irvine Company, Newport Beach. Report prepared by The Keith Companies, Costa Mesa. On file, South Central Coastal Archaeological Information Center, California State University, Fullerton.

Howard, William L., and L. Mark Raab
1993 *Olivella* Grooved Rectangle Beads as Evidence of a Mid-Holocene Southern Channel Islands Interaction Sphere. *Pacific Coast Archaeological Society Quarterly* 29(3):1–11.

King, Chester D.
1990 *The Evolution of Chumash Society: A Comparative Study of Artifacts Used in System Maintenance in the Santa Barbara Channel Region Before A.D. 1804*. Garland Publishing, New York.

Koerper, Henry C., and Christopher E. Drover
1983 Chronology Building for Coastal Orange County: the Case from CA-ORA-119-A. *Pacific Coast Archaeological Society Quarterly* 19(2):1–34.

Koerper, Henry C., Jonathon E. Ericson, Christopher E. Drover, and Paul E. Langenwalter II
1986 Obsidian Exchange in Prehistoric Orange County. *Pacific Coast Archaeological Society Quarterly* 22(1):33–69.

Koerper, Henry C., Jonathon E. Ericson, Donald L. Fife, M. Steven Shackley, Clay A. Singer, and John A. Minch
1992 Jasper Procurement, Trade, and Control in Orange County: Comments and Observations. *Journal of California and Great Basin Anthropology* 14(2):235–246.

Koerper, Henry C., Donald L. Fife, Clay A. Singer, and Jonathon E. Ericson
1987 Comments on Cottrell's Long Distance Jasper Trade Hypothesis: In Defense of Renfrew's Trade Models. *American Antiquity* 52(3):623–630.

Mason, Roger D.
1991 *Newport Coast Archaeological Project: Project Background and Research Design.* Report prepared for Coastal Community Builders, a division of The Irvine Company, Newport Beach. Report prepared by The Keith Companies, Costa Mesa. On file, South Central Coastal Archaeological Information Center, California State University, Fullerton.
2008 The Spatial Organization of Activities at CA-ORA-662 on Pelican Hill in the Newport Coast Area, Orange County, California. *Pacific Coast Archaeological Society Quarterly* 40(2):15–40.

Mason, Roger D., and Mark L. Peterson
1994 *Newport Coast Archaeological Project: Newport Coast Settlement Systems, Analysis and Discussion.* Report prepared for Coastal Community Builders, a division of The Irvine Company, Newport Beach. Report prepared by The Keith Companies, Costa Mesa. On file, South Central Coastal Archaeological Information Center, California State University, Fullerton.

Van Horn, David M.
1986 The Hoopaugh Site (ORA-507), a Prehistoric Quarry in the Foothills of the Santa Ana Mountains. *Pacific Coast Archaeological Society Quarterly* 22(1):1–21.

Wallace, William J.
1955 A Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology* 11(3):214–230.