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The Cico Chert Source on San Miguel Island, California

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A major source of high quality chert was recently identified on San Miguel Island, where archaeological sites spanning much of the Holocene contain artifacts of this same material. Some varieties of this translucent chert are macroscopically similar to Santa Cruz Island chert, leading to possible confusion about the origin of some Channel Island lithic assemblages. Preliminary petrographic studies suggest that Cico cherts can be differentiated from Santa Cruz Island cherts microscopically, but additional research is needed to document the variability inherent in both chert types. Although the Chumash appear to have used Cico chert to make microblade drills and shell beads, the extent of such activities has yet to be determined.

AT the time of European contact, the Chumash and their coastal southern California neighbors were among the most culturally complex of California societies. This complexity is seen in the archaeological and historical records in the form of high population densities, hierarchical social organization, craft specialization, intensive trade, and use of shell bead currencies. A crucial aspect of reconstructing the development and structure of socioeconomic complexity lies in understanding patterns of resource use in various areas and the trade and other interaction patterns that developed to redistribute materials between various social groups. The exchange of raw materials and manufactured goods may have been

especially important on many of the California islands, where native peoples were relatively isolated and had access to a limited variety of terrestrial foods and lithic sources.

In the archaeological record, some of the more important and traceable manufacturing materials are various siliceous rock types used to make flaked stone tools. Recently, lithic use patterns on the Northern Channel Islands have played a central role in discussions of the development of Chumash complexity. As Arnold (1987, 1990, 1992) has shown, the use of localized chert outcrops on Santa Cruz Island was crucial to the specialized and intensive production of microblade drills used to make shell beads. According to Arnold (1992:73), on Santa Cruz Island "Late period microblade manufacturers were legitimate craft specialists, controlling access to the single chert-source area on the islands and producing large quantities of standardized microliths solely in a small zone on the northeastern shore of the island." Until recently, these Santa Cruz Island quarries were thought to be the only significant sources of quality chert available to the island Chumash (e.g., Arnold 1987; Rozaire 1993:63).

During recent work on the Northern Channel Islands, however, we discovered another source of high-quality chalcedonic chert on San Miguel Island (Fig. 1). This chert source is important because: (1) it extends the distribution and availability of quality siliceous toolstone on the Northern Channel Islands; (2) archaeological data indicate that it was widely used on San Miguel Island, with the earliest evidence beginning 10,000 or more years ago; (3) it overlaps in macroscopic appearance with Santa Cruz Island chert—a source of potential confusion in reconstructing Chumash trade and resource use patterns; and (4) it appears to have been used to manufacture microblade bead drills by Late Period populations on San Miguel Island.

In this report, we summarize the information available about the location and geological con-

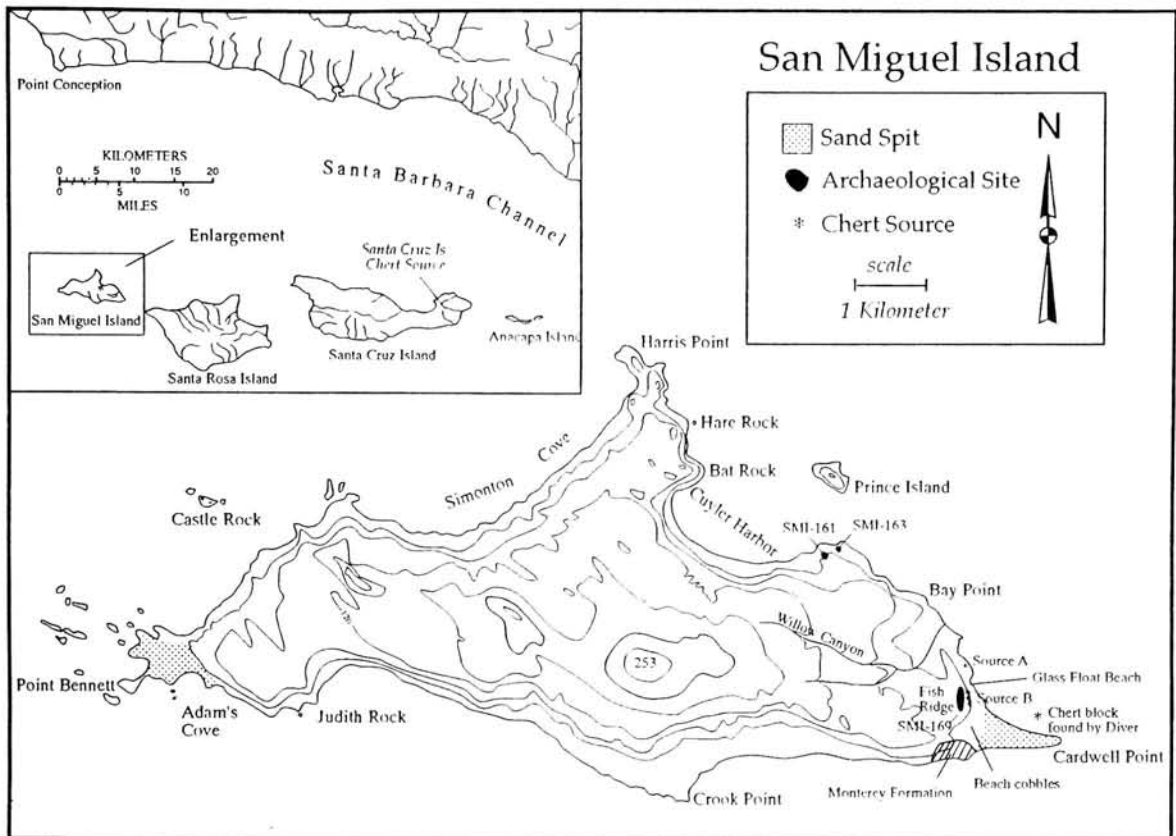


Fig. 1. The locations of Chico chert outcrops on San Miguel Island.

text of the Chico chert source, discuss the macroscopic and microscopic characteristics of the chert, provide evidence for its widespread and long-term use at sites on San Miguel Island, and suggest some potential avenues for further research. It should be stressed that our studies have thus far been limited primarily to archaeological and geological reconnaissance surveys, background research, and preliminary petrographic analysis of cherts from San Miguel and Santa Cruz islands. Since a detailed analysis of such topics could take several years, this initial report allows the discovery of Chico chert to be incorporated into rapidly developing models of Santa Barbara Channel prehistory.

THE REDISCOVERY OF CICO CHERT

While working on San Miguel Island from 1992 to 1996, we were surprised to find large

numbers of artifacts made from a distinctive translucent chert—white, buff, gray, or brown in color—on the surface of several sites along the northeast coast of the island. A large Middle Holocene “red abalone” midden (CA-SMI-161; see Fig. 1) located near the east end of Cuyler Harbor, for instance, had numerous large cores and other artifacts of this chalcedonic chert on its surface. Some of the cores superficially resembled Santa Cruz Island chert, but were of a quality that seemed unlikely to have been imported from Santa Cruz Island quarries without further reduction. At other sites on the east end of San Miguel Island, we continued to find large numbers of artifacts made from this translucent—and often high quality—chert.

Site records from earlier San Miguel Island surveys (e.g., Greenwood 1978; Rozaire 1978) contained references to chert cobbles that were

observed on the beach near the east end of Cuyler Harbor. Site records from the lower Willow Canyon area in the northeast part of the island also had numerous references to cores and debitage of translucent chert. Searching the shoreline east of Cuyler Harbor in 1993, we found no chert cobbles, but a survey of the northeast coast proved more productive. Here, two outcrops of chert were located north and west of Cardwell Point, along with cobbles or small boulders found on the beach near the base of Cardwell Point itself (Fig. 1). The most extensive of these was a talus slope exposed by shoreline erosion below Fish Ridge, where numerous angular cobble or boulder-sized clasts of translucent chert were found eroding from sea cliff exposures. One large, angular chert block that was found on the beach immediately below this talus slope was estimated to weigh several hundred kilograms. On the ridge immediately above and west of this source, a dense deposit of Cico chert core reduction debris (CA-SMI-169; see Fig. 1) was noted. This deposit extended for several hundred meters along the crest of Fish Ridge between about 60 m. and 75 m. above sea level.

Later in 1993, Don Morris (personal communication, 1993) advised us that a diver had brought a block of similar chert to the Santa Barbara Museum of Natural History. This material had reportedly been exposed in a rock ledge submerged off Cardwell Point. Knowing that this distinctive chert was used by the Chumash for millennia prior to our own "discovery," we christened it Cico chert—an abbreviated version of *Ciquimmuyumu*, the Chumash word for San Miguel Island, as recorded in the accounts of Cabrillo's voyage of 1542 (King 1975:177).

CICO CHERT: GEOLOGICAL CONTEXT AND CHARACTERISTICS

Cico chert is found in veins within the Miocene San Miguel volcanics, in loose cobble to boulder-sized clasts in Quaternary talus deposits, and on certain cobble or boulder beaches along

the northeast coast of San Miguel Island. Intact chert veins are composed of clear to cloudy gray quartz cutting through a volcanoclastic conglomerate exposed above Glass Float Beach near the east end of the island (Source A, Fig. 1). Here, veins of chalcedonic chert two to five cm. thick form a set of parallel, subvertical sheets, trending roughly east to west. Vein material appears to be similar in composition to the quartz cement binding the volcanoclastic cobbles, and veins range from massive to separate distinct and irregular (botryoidal) layers. Locally, the veins include layers rich in pyrite that are gray to black in appearance, or brecciated fragments of the host rock. Because of their similar appearance and because the composition of the talus suggests that much of the debris was also derived from the San Miguel volcanics conglomerate, the talus clasts (Source B, Fig. 1) probably have a similar origin as the veins. Some of the chert talus clasts are much larger than any of the exposed veins, however, and are probably derived from thicker veins now eroded from Fish Ridge or buried under accumulating talus.

Like Santa Cruz Island cherts (Arnold 1987:97), the quality of Cico chert nodules varies considerably. The materials observed to date are primarily massive rather than bedded or banded. Fist-sized or larger clasts of Cico chert often contain small, irregular voids or inclusions of oxidized minerals. From most large clasts, however, it is possible to obtain relatively large cores or flakes of high-quality chalcedonic chert. Archaeological occurrences and replicative experiments show that this material is suitable for making a variety of macrolithic and microlithic artifact types.

Macroscopically, large pieces of Cico chert are clearly distinct from classic Monterey and Franciscan cherts of the mainland coast. Our studies suggest that small flakes of Cico and Monterey cherts may occasionally overlap in macroscopic appearance, but this problem appears to be rare. Cico chert clasts also generally

differ from Santa Cruz Island cherts, but there is much more macroscopic overlap, creating difficulties in the visual differentiation between samples of the two island cherts. According to Arnold (1987:97), the range of colors of Santa Cruz Island cherts includes "white, blonde, light brown, dark brown, gray, and occasionally bluish in cast." Cico cherts generally fall within this same range of colors—with translucent whites, grays, and blondes (yellowish brown) most common—but also include occasional reddish brown and grayish purple specimens. Disseminated pyrite imparts a dark gray color to some layers, which locally turn reddish brown with oxidation. Macroscopically, veins are either homogeneous or composed of several visually distinct, parallel layers. Open voids lined with small macroscopic quartz crystals are present in some samples.

Preliminary petrographic studies of Cico and Santa Cruz Island cherts suggest that the microstructure of the two cherts is often distinctive. In microscopic thin sections, Cico cherts are composed principally of chalcedony and microcrystalline quartz. Megaquartz is common, especially in the late stages of vein formation. Aggregated or disseminated cubic pyrite crystals are abundant in some layers, while others contain none. Trace to minor amounts of carbonate are present in some samples, some of which have been replaced by chalcedony, leaving residual iron oxides. In contrast, Santa Cruz Island cherts generally contain microlayered carbonate (chiefly dolomite) rhombs and framboidal pyrite crystals. Both island chert sources are characterized by considerable variability, however, and more research is required to determine the range of potential overlap (both macroscopic and microscopic) between the two.

SPATIAL AND TEMPORAL DISTRIBUTIONS OF CICO CHERT

More research is also needed to document the spatial and temporal dimensions of Cico chert

utilization in the Santa Barbara Channel area. So far, significant quantities of Cico chert have been noted in sites distributed over much of the eastern end of San Miguel Island, and smaller quantities have been observed at sites along much of the north coast. The San Miguel volcanics are widely distributed on San Miguel and Santa Rosa islands (see Weaver 1969), however, and it is conceivable that additional localized sources exist (or existed in the past). Tools made from material macroscopically similar to Cico chert were recently found at sites on western Santa Rosa Island (D. Morris, personal communication 1995). Currently, it is unclear if Cico chert outcrops exist on Santa Rosa Island, or whether Santa Rosa Islanders traveled to San Miguel Island to obtain Cico chert, obtained it through trade, or a combination of the two. That Cico chert played a role in Chumash exchange networks is suggested, however, by the recent identification of a large projectile point made from classic Cico chert in an artifact collection that was reportedly looted from two mainland Chumash village sites (CA-SBA-72 and -73) at Tecolote Canyon on the western Santa Barbara coast.

Recent investigations at Daisy Cave (CA-SMI-261) provided some important data on temporal patterns of Cico chert use on San Miguel Island. Located less than two km. from the source, Daisy Cave contains Cico chert artifacts in archaeological strata from Unit D6 that were radiocarbon dated between about 10,600 and 3,200 RCYBP (Erlandson et al. 1997; Table 1). Significant percentages of flaked stone artifacts made from Cico chert are not evident at Daisy Cave, however, until about 6,000 RCYBP. The apparent increase in the intensity of Cico chert use during the Middle and Late Holocene suggests that the source may have been less accessible during the Early Holocene. It is possible, for instance, that rising sea levels, coastal erosion, shifting sand dunes, or other geological processes exposed significant quantities of Cico

Table 1
 PERCENTAGES OF LITHIC RAW MATERIAL TYPES IN UNIT D6 AT DAISY CAVE (CA-SMI-261)

Stratum	Age (RCYBP) ^a	Number	Material Type (by %)				
			CC	MC	SS	MV	Other
A	3,200	11	9.1	9.1	18.2	45.5	18.2
C	6,000	30	23.3	30.0	30.0	16.7	0.0
E1	7,800	98	0.0	44.9	52.0	2.0	1.0
E2	7,900	169	1.2	65.1	24.9	7.1	1.8
E3	8,000	244	2.5	57.8	32.0	2.9	4.9
F1	8,600	404	2.5	66.3	29.5	1.2	0.5
F2	8,800	967	2.5	67.3	27.7	2.1	0.4
G	10,300	34	2.9	26.5	52.9	17.6	0.0

^a Age estimates for individual strata, in uncorrected radiocarbon years, are based on a suite of 25 dates on marine shell and charcoal (Erlandson et al. 1997). For lithic raw material types: CC = Cico chert; MC = Monterey chert; SS = siliceous shale; MV = metavolcanic.

chert only after that time. Well-stratified samples are currently not available from Daisy Cave deposits younger than about 3,200 RCYBP. Rozaire (1993:71-72) recovered a beadmaker's cache in Middle or Late period deposits at Daisy Cave, however, which contained 50 chert microblades or microdrills. The source of these chert artifacts has not been determined, but petrographic examination of a triangular microdrill from a Late Period village site (CA-SMI-163; see Fig. 1) located east of Cuyler Harbor indicated that it was made from chert microscopically indistinguishable from *in situ* veins of Cico chert. This suggests that Chumash use of Cico chert probably continued up to the time of European contact and that Cico chert played some role in the microblade and beadmaking industries of the Northern Channel Islands.

CONCLUSIONS

As the discovery of a major new chert source on San Miguel Island clearly demonstrates, we still have only a limited understanding of the primary and secondary distributions of many cherts and other minerals used by Native Americans along the southern California coast. Be-

cause such materials preserve well in the archaeological record and were widely used by native peoples, they are one of the best sources of information about patterns of resource exploitation and exchange, and how such patterns may have changed through time. As our models of resource use, manufacturing processes, exchange, and socioeconomic complexity become increasingly sophisticated, it becomes ever more important that we have detailed baseline information on the spatial distribution of raw material sources. Without such data, we cannot hope to understand the full complexity of societal relationships among the Chumash and their neighbors.

Although data from Daisy Cave suggest that Cico chert was used by San Miguel Islanders for roughly 10,000 years, cherts and siliceous shales from the Monterey Formation dominate the flaked stone assemblage throughout the site sequence. This suggests that a local source of these materials may also be present on San Miguel Island or western Santa Rosa Island. In fact, we have found small pebbles of classic black and dark brown Monterey cherts in raised beach deposits on San Miguel Island, and larger

nodules of low-quality, banded Monterey cherts have been found on western Santa Rosa Island. More research is needed to document the spatial distribution of lithic raw material sources on the Northern Channel Islands, the larger Santa Barbara Channel, and adjacent areas of the southern California coast.

While Cico chert seems to have played some role in the microblade and shell bead industries of the Island Chumash, its importance is not yet clear. While microblades have been found in a number of Late Holocene archaeological sites on San Miguel Island (see Glassow 1982; Greenwood 1982; Walker and Sneathkamp 1984; Rozaire 1993; Erlandson et al. 1997), it is not currently known if any of these were made from Cico chert. Furthermore, although there has been no systematic search, we have yet to find evidence on San Miguel Island for microblade production even remotely comparable to that documented by Arnold (1987, 1990) on Santa Cruz Island.

During the Middle and Late periods of Santa Barbara Channel prehistory, the Santa Cruz Island microblade industry was one component in a complex economy involving trade between the peoples of the Channel Islands, the adjacent mainland, and beyond (King 1976). In her provocative and meticulous research, Arnold (1987, 1990, 1992) has linked the localized nature of chert sources on eastern Santa Cruz Island to elite control of this limited resource, the development of craft specialization, and the appearance of Chumash chiefdoms during the Middle to Late period transition. If evidence is found that Cico chert played a significant role in Channel Island microblade and beadmaking industries, this will not necessarily negate any of these conclusions. However, it would significantly enlarge the socioeconomic sphere encompassed by such specialized industries, complicating the reconstruction of economic relationships between island groups and mainland populations.

For now, it can no longer be assumed that

translucent chert microblades from the Northern Channel Islands all come from Santa Cruz Island sources. Further petrographic analysis of Cico and Santa Cruz Island cherts is needed to determine the full range of variability found within and between the two sources. Once cherts from different island sources have been characterized petrographically, collections from the Northern Channel Islands can be analyzed to determine if Cico chert played a significant role in the microblade and shell bead industries of the Island Chumash.

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