MODELING CULTURAL CONNECTIONS BETWEEN THE SOUTHERN CHANNEL ISLANDS AND WESTERN UNITED STATES: THE MIDDLE HOLOCENE DISTRIBUTION OF *OLIVELLA* GROOVED RECTANGLE BEADS

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ABSTRACT

Recent research shows that a distinctive type of prehistoric marine shell bead found on the southern Channel Islands consistently yields radiocarbon ages of between 4,200 and 5,200 years before present (BP). Moreover, this bead type, *Olivella* Grooved Rectangles, has a geographic distribution that includes portions of California, Nevada, and Oregon. The temporal-spatial distribution of these beads suggests that the Southern Channel Islands were linked during Middle Holocene times to a widespread sphere of cultural interaction that may have had a linguistic foundation.

Keywords: Archaeology, Southern Channel Islands, *Olivella* Grooved Rectangle beads, Middle Holocene.

SHELL BEADS AND CULTURAL INTERACTION

Archaeology has made remarkable strides during the last century in deciphering the prehistory of California and other regions of North America. Few supposed, however, that the California Channel Islands might be strategically important to recognizing and reconstructing prehistoric cultural patterns extending over vast areas of western North America. After all, it was difficult to imagine what the ancient inhabitants of the comparatively small, remote, and intensively maritime Channel Islands might have in common with populations that occupied the interior of California and surrounding regions. This perception is rapidly changing. Recent archaeological research shows that the Southern Channel Islands had cultural links with mainland populations as far away as the northern Great Basin, and at least as early as 5,000 radiocarbon years ago (RYBP). The Channel Islands are increasingly perceived by archaeologists as key sources of information about prehistoric cultural patterns of much larger scope and antiquity than was previously recognized.

In a recent report, Jenkins and Erlandson (1997) describe the spatial and temporal distribution of *Olivella* grooved rectangle (OGR) beads in the western Great Basin and California. This discussion amplifies an earlier report by Howard and Raab (1993), in which we argued that the spatial and temporal distribution of OGR beads in southern California may mark a middle Holocene cultural interaction sphere. In brief, we noted that California OGR beads have been recovered almost exclusively from archaeological sites located on the Southern Channel Islands and adjacent regions of Los Angeles and Orange counties. Numerous radiocarbon dates associated with these beads range between about 4,200 and 5,200 RYBP (Howard and Raab 1993; Vellanoweth 1995). We also pointed out that no OGR beads have been reported to date from the Northern Channel Islands, with only one specimen reported from the Santa Barbara coast (Howard and Raab 1993). And yet, OGR specimens have been recovered from numerous localities in the western Great Basin.

An observation by King (1990:111) provided a provocative element to this geographic pattern: The California OGR beads are found in a region occupied historically by peoples of Uto-Aztecan linguistic affiliation. Based on all of these observations, it seemed reasonable to suggest that the Southern Channel Islands and adjacent regions of southern California may have been linked in a cultural interaction sphere involving a Uto-Aztecan linguistic community, or communities, as early as middle Holocene times. Based on a similar line of reasoning, Vellanoweth (1995) proposed that such peoples may have arrived at least a millennium earlier than researchers had previously reconstructed for the "Shoshonean Wedge" in southern California (Kowta 1969; Koerper 1979; Moratto 1984:560).

Recently, Jenkins and Erlandson (1997) provided valuable new data by demonstrating the existence of OGR beads at the DJ Ranch site in the Fort Rock Valley of Oregon. These specimens, the most distant from the southern California coast recorded to date, are close to the younger end of the age spectrum of California OGR beads, with an age of about 4,150 RYBP (4,700 calendar years BP (CYBP); Jenkins and Erlandson 1997). This discovery adds a dramatically greater spatial dimension to the OGR distributional pattern:

> "As suggested by Howard and Raab (1993) and others, the distribution of OGR beads along the southern California coast and their presence in Middle Holocene sites in the western and northern Great Basin may support the existence of an early cultural interaction sphere, possibly linking Uto-Aztecan peoples of the southern California coast

and the western Great Basin. Remarkably, more OGR beads have now been found at the DJ Ranch site in central Oregon, up to 1,200 km from their probable point of origin on the southern Channel Islands, than have been found in the heavily studied Santa Barbara Channel region immediately to the north of the proposed cultural interaction sphere" (Jenkins and Erlandson 1997:301).

In the present discussion, we review the presently understood temporal and spatial distribution of OGR beads in California and the Great Basin. The distribution of these artifacts may prove useful in understanding contacts between southern California and interior regions, including the Great Basin in a middle Holocene time range. We conclude this discussion with some suggestions about directions that future research on the OGR beads might take.

THE DISTRIBUTION AND AGE OF OGR BEADS

Geographic Distribution

In the last five years, OGR beads have come under scrutiny by archaeologists working in both California and the Great Basin. Increasing efforts are being made to recognize and date this bead type. Here, we summarize some of results of these studies. This summary is an attempt to relate some of the most salient results of this research, not to provide an encyclopedic account of all known OGR bead data. Figure 1 illustrates the currently known geographic distribution of OGR beads.

Bennyhoff and Hughes (1987:141-142) assign OGR beads to their Class N, a rare type made from the marine purple olive shell (*Olivella biplicata*). This type is described as a, "Rectanguloid to oval bead with ground edges and an elongate perforation formed by a central groove transverse

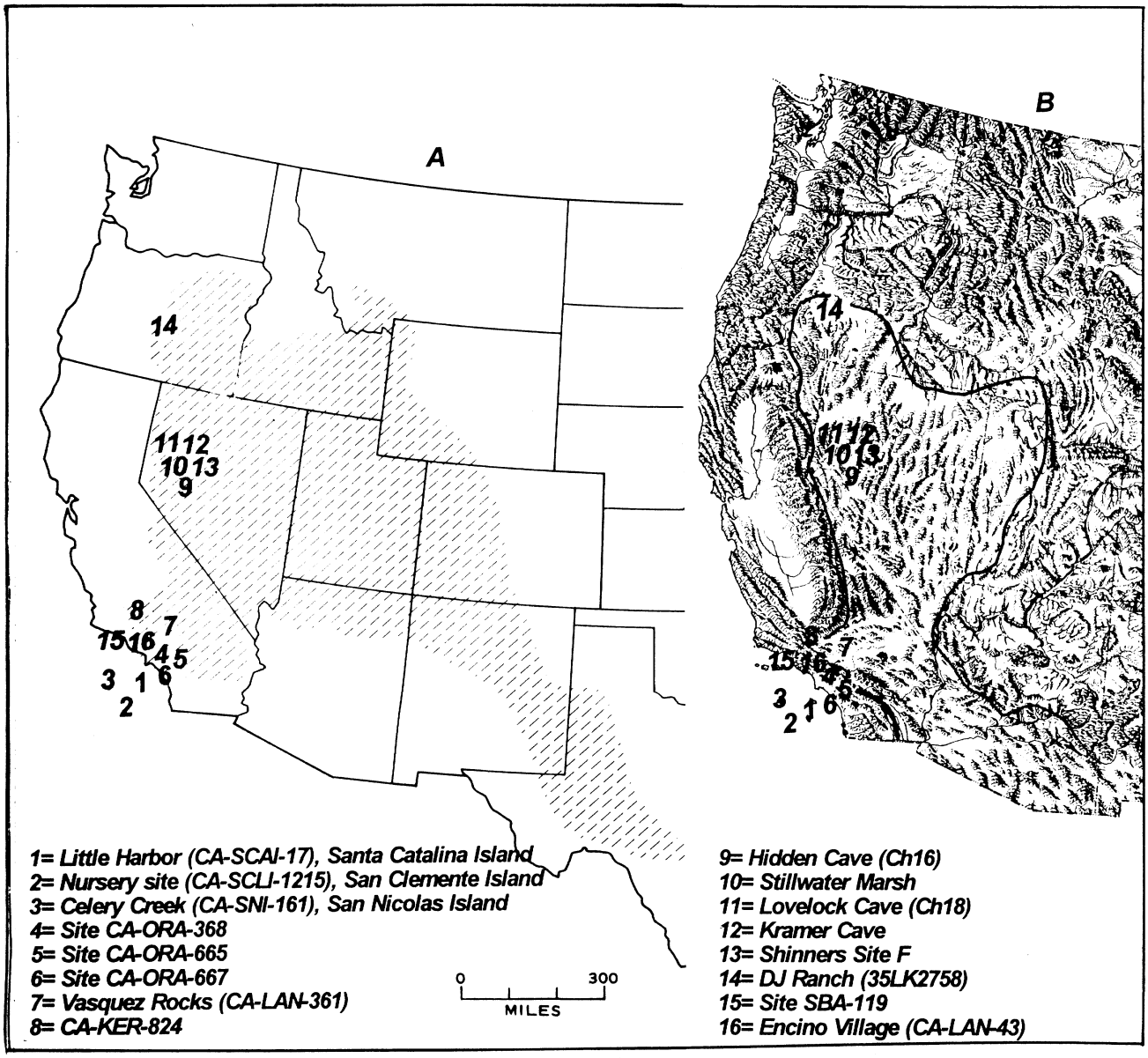

Figure 1. Geographic distribution of *Olivella* Grooved Rectangle beads.

Figure 2. *Olivella* Grooved Rectangular beads from Cultural Component 2, Site CA-SCAI-17 (Little Harbor), Santa Catalina Island, CA. Scale: 1 mm between small lines.

to the long axis of the shell." Two varieties of this type, large (N1) and small (N2), are described by Bennyhoff and Hughes (1987:141-142). This style of perforation, virtually a unique attribute of prehistoric shell beads of California and the Great Basin, permits this bead type to be differentiated from others with a high degree of reliability. The OGR beads in Figure 2, in this instance from California's southern Channel Islands, illustrate this mode of perforation.

When the Bennyhoff and Hughes (1987) monograph was published more than a decade ago, OGR beads were known from several locations in southern California and the Great Basin. California coastal locations included site CA-ORA-368 (Bolsa Chica Mesa, Orange County), CA-SBA-119 (Rincon, Santa Barbara County) and CA-SCAI-17 (Little Harbor, Santa Catalina Island; Bennyhoff and Hughes 1987:142; Figure 1, numbers 4, 15 and 1), and from site CA-KER-824 (Kern County; Bennyhoff and Hughes 1987:139; Figure 1, number 8). Sites in the Carson Sink region of western Nevada represent a conspicuous cluster of OGR specimens, including Lovelock Cave, Kramer Cave (Bennyhoff and Heizer 1958:69, 75; Figure 1, numbers 11 and 12), Hidden Cave, Stillwater Marsh dune and Shinners Site F (Bennyhoff and Hughes 1987:141-142; Figure 1, numbers 9, 10 and 13). Three years later, King (1990:111; Figure 1, numbers 7 and 16) offered additional comments on this type, noting that California OGR specimens had been recovered at two Los Angeles County archaeological sites, CA-LAN-361 (Vasquez Rocks) and CA-LAN-43 (Encino Village), as well as the Little Harbor site mentioned above.

In 1991, the authors recovered OGR beads from an excavation at the Little Harbor site on Santa Catalina Island. At Little Harbor, radiocarbon dating (Raab et al. 1995) suggested that OGR beads might be assignable to a comparatively narrow span of time, thus making this bead a useful "type fossil" in chronology building. With this objective in mind, we re-examined OGR beads excavated during 1990 by the authors and a colleague, Andrew Yatsko, at the Nursery site (CA-SCLI-1215) on San Clemente Island. In the Nursery site collection we identified OGR specimens taken from the fill of a prehistoric house pit feature (Howard and Raab 1993; Salls et al. 1993; Raab et al. 1994; Figure 1, numbers 1 and 2). In 1992, we expanded our search for OGR beads in order to understand better the distribution of this type in the larger Channel Islands region. This effort was rewarded by reports of OGR beads at sites CA-ORA-665 and -667 (Irvine Ranch) on the Orange County coast (Howard and Raab 1993; Figure 1, numbers 5 and 6). Further investigation also confirmed the presence of OGR beads in museum collections of artifacts from San Nicolas Island.

Following our investigations, discussions of OGR beads in the context of southern Channel Islands prehistory were published by Howard and Raab (1993) and Raab et al. (1994). Points made in these discussions were later addressed by Vellanoweth (1995; Figure 1, number 3), who has documented OGR beads at site CA-SNI-161, San Nicolas Island, and by Jenkins and Erlandson (1997; Figure 1, number 14), who have recently reported OGR beads from the DJ Ranch site (35LK2758) in the Fort Rock Basin of central Oregon.

Chronology

Earlier studies of OGR beads were significantly hindered by a lack of chronological control. Bennyhoff and Hughes (1987:150) specifically note the often poor contextual integrity of Great Basin sites containing beads, including type N (OGR) specimens:

> "As a consequence, many types must be phased by cross dating from California occurrences, without stratigraphic support from the Great Basin. This problem is particularly vexing for types restricted at present to the Great Basin... or rare in California (*Olivella* types Alci, G4, N)."

The age of OGR specimens from some California contexts are equally uncertain. Examples that fall into this category are specimens from sites CA-KER-824, CA-LAN-361 and CA-LAN-43. Fortunately, more recent work allows the age of OGR beads to be estimated with greater precision. The California Channel Islands are important in this respect. These islands often contain archaeological deposits with an exceptionally high degree of stratigraphic integrity, owing

to a lack of burrowing animals and the intrusion of urban-industrial development. As a result of such conditions, (Howard and Raab 1993; Raab et al. 1994, 1995), radiocarbon dates from Santa Catalina and San Clemente Islands reveal a relatively well-defined, middle Holocene time range for OGR beads. These beads have been found in deposits at the Little Harbor site (Santa Catalina Island) and the Nursery site (San Clemente Island) with radiocarbon dates that range between about 4,300 and 5,200 RYBP (^{13}C-adjusted dates; Howard and Raab 1993; Raab et al. 1994, 1995). On San Nicolas Island, Vellanoweth (1995) reports OGR beads from the Celery Creek site with a range of about 4,200 to 4,800 RYBP (uncorrected ^{14}C dates).

On the adjacent mainland coast, Mason et al. (1992a:58; 1992b:15) obtained radiocarbon dates that range from about 4,600 to 5,010 RYBP for OGR beads in sites CA-ORA-665 and CA-ORA-667. Based on these data, an age range of about 4,200 to 5,200 RYBP, or about 5,000 to 5,900 CYBP (Stuiver and Reimer 1993), seems a reasonable age for the southern California coastal specimens. Bennyhoff and Hughes' (1987:142) suggested date for some of the Nevada OGR specimens, between about 1950 and 1670 BC, is close to the lower end of the southern California coastal age range.

In an important recent discovery, OGR beads from the DJ Ranch site in central Oregon (Figure 1, number 14) yielded an age of about 4,150 RYBP (Jenkins and Erlandson 1997); consistent with the younger end of the coastal southern California age range. These discoveries establish a convincing middle Holocene time range for OGR beads of approximately 4,200 to 5,200 RYBP.

CULTURAL PATTERNING IN CALIFORNIA

In earlier discussions, Howard and Raab (1993) and Raab et. al. (1994) suggested that OGR beads might point to a middle Holocene cultural interaction sphere that encompassed the Southern Channel Islands (Santa Catalina, San Clemente and San Nicolas; Figure 1, numbers 1, 2 and 3), and portions of the adjacent mainland coast. This conclusion was based on two key observations:

1) Despite over a century of archaeological research in coastal southern California, including considerable attention to marine shell beads and ornaments, OGR beads, as far as we know, have never been reported in the northern Channel Islands (e.g, King 1990). Informal consultation with scores of our colleagues has also failed to produce any reports of OGR beads in the Northern Channel Islands. To our knowledge, only one OGR bead currently is known from the Santa Barbara Channel region (King 1990:110: CA-SBA-119 on the mainland coast; Figure 1, number 15). No OGR specimens are reported by Bennyhoff and Hughes (1987:141-142) from central California. King (1990:111) notes that he has not observed OGR specimens in central California bead collections. As we concluded elsewhere (Howard and Raab 1993; Raab et al. 1994), OGR beads appear to exist primarily on the Southern Channel Islands, portions of the adjacent California mainland and in portions of the western Great Basin.

2) King (1990:111) offers this provocative note regarding the distribution of OGR beads: "On the basis of present information, it appears that beads with grooved holes were used at the end of the Early period or at the beginning of the Middle period mainly in areas where the historical native people spoke Uto-Aztecan languages."

Given these patterns, we suggested that OGR beads might have been transported in a cultural sphere defined by a Takic language community. Languages within this group (e.g., the Cupan language dialects spoken by the island Gabrielino) represent one of the California sub-divisions of the larger Uto-Aztecan linguistic province (Harrington 1962; Kroeber 1976:574-580; Moratto 1984:541-543). It seemed reasonable to hypothesize that ethnic or social identities connected to language might have provided a sphere of interaction that included trade or exchange of items such as beads, and thus account for the apparent spatial overlap between the distribution of OGR beads and a Takic linguistic region in southern California. We are not alone in suggesting a possible prehistoric linguistic frontier:

> "While at least 46 OGR beads have been recovered in Great Basin sites in Nevada and Oregon, only one OGR bead has been found in the Santa Barbara Channel region, suggesting that a cultural boundary or frontier may have existed between proto-Tongva and proto-Chumash peoples as early as 5,000 years ago. Ultimately, however, more data on the spatial and temporal distributions of OGR beads and other distinctive artifact types are needed to effectively examine relationships between archaeological and linguistic models of human migrations in California and the Great Basin" (Jenkins and Erlandson 1997:301).

FUTURE RESEARCH DIRECTIONS

In the last few years, the investigation of OGR beads has taken on the quality of a detective story, with researchers in both the Great Basin and southern California confirming a relatively discrete middle Holocene time range for the beads throughout their known geographic range. The latter includes the Southern Channel Islands of California, portions of the adjacent mainland coast and interior locations within southern California, archaeological sites located in western Nevada and, most recently, the DJ Ranch site in central Oregon (Jenkins and Erlandson 1997). The distribution of marine shell beads over this large area is, in itself, hardly a remarkable discovery. Research long ago

demonstrated that shell beads of Pacific coast origin made their way into the Great Basin with some degree of regularity, perhaps beginning during the early Holocene (Bennyhoff and Heizer 1958; Bennyhoff and Hughes 1987). And yet, the distinctive spatial patterning of the OGR beads suggests that the movement of at least some of these beads from the coast to the interior was not a random process of diffusion but one that involved particular, if as yet poorly known, cultural dynamics.

Certainly, a good deal of caution is required in advancing models or theories to account for the cultural dynamics related to the OGR beads. Just the same, we argue that future research on OGR beads can play a useful role in advancing at least two long-standing research topics that involve the Great Basin and southern California. These topics, considered next, are linguistic prehistory and the problem of the southern California "Shoshonean Wedge" phenomenon.

Linguistic Prehistory

The spatial distribution of OGR beads suggests that a middle Holocene cultural frontier may have existed far beyond the bounds of the southern Channel Islands, and this frontier may have involved linguistic factors. In Figure 1A, the cross-hatched area represents the approximate spatial extent of the Uto-Aztecan linguistic province in historic times, as reconstructed by Kroeber (1976:576). Archaeological sites currently known to contain OGR beads (numbers 1 through 16 in Figure 1) are plotted in relation to this area. While the current bead distribution certainly reflects large gaps in existing archaeological information and must be viewed as tentative, it is nevertheless striking that (a) OGR beads are virtually unknown beyond the historic Uto-Aztecan linguistic province and (b) the distribution of these beads is essentially coterminous with the western margin of this province.

A critical question posed by these patterns is whether archaeological data can reasonably be used to reconstruct linguistic prehistory. In the Great Basin, debates about linguistic prehistory have arisen in connection with explaining the origins and spread of the Great Basin's prehistoric Numic-speakers (Aikens and Witherspoon 1986; Madsen and Rhode 1994; Young and Bettinger 1992). Some researchers have advanced linguistic reconstructions as part of modeling the Numic problem (see Rhode and Madsen 1994 for a review of this topic), while other researchers such as Jones (1994) are highly critical of these efforts, correctly pointing out that language and culture are separate phenomena, and that archaeological evidence is not linguistic behavior. At issue, too, is the timing of the Numic expansion, with most authorities viewing it as a late Holocene phenomenon. We want to be clear in pointing out that our efforts here are aimed at broader pattern recognition, not an attempt to resolve issues surrounding the Numic expansion.

The Numic question aside, some authorities are unwilling to abandon completely efforts to reconstruct linguistic prehistory. As Moratto notes (1984:541-570), the prehistoric development of the Uto-Aztecan languages is a matter of continuing debate. By all accounts, this development must have involved a complex pattern of contact and interaction with other linguistic stocks. Experts also generally agree that any developmental reconstruction must be predicated on the existence of a proto-Uto-Aztecan (PUA) linguistic stock of great antiquity. At the same time, researchers offer widely divergent opinions regarding the place of origin and subsequent spread of this PUA stock, as Moratto points out (1984:541-542, 549-551, 559-560). Regarding Uto-Aztecan linguistic evolution, Moratto (1984:541) suggests that:

> "The origins and age of Uto-Aztecan remain to be worked out. Linguistic geography and degree of internal differentiation suggest that Uto-Aztecan is younger than Hokan, Penutian, or Algic. Glottochronology indicates roughly 50 minimum centuries of Uto-Aztecan time depth (Moratto 1984:541)...Many Language shifts evidently occurred in the Far West during [the] mid-Altithermal period. It seems likely that Proto-Uto-Aztecan (PUA) or pre-PUA began to diversify 5000 years ago...but opinions about the origins of this stock are far from unified" (Moratto 1984:549).

The existing OGR bead data cannot reconcile the divergent scenarios that have been advanced for Uto-Aztecan linguistic prehistory or answer the question of whether this prehistory is truly accessible by archaeological means. Even so, any resolution of these issues must begin with attempts at pattern recognition. In that vein, the OGR bead data may offer useful insights. The modal age of OGR beads throughout their geographic range appears to be about 5,000 CYBP. In other words, not only do these artifacts "map onto" the historic western frontier of the Uto-Aztecan linguistic area, their age is consistent with the postulated age of the appearance of PUA, based on glottochronological evidence. If this temporal connection is accepted, at least as a working hypothesis, it implies a middle Holocene linguistic frontier as vast as that mapped for the historic distribution of Uto-Aztecan languages. Moreover, we see no reason to imagine that OGR beads could not have been moved within a linguistically-mediated sphere of interaction that was co-extensive with this frontier.

The "Shoshonean Wedge"

The model presented above has several interesting research implications. For researchers in southern California, this model may help to evaluate competing explanations of the "Shoshonean Wedge" phenomenon. This phenomenon, a long-standing research interest in California archaeology (Kroeber 1976:574-580), posits the migration of peoples representing the Takic sub-division of Uto-Aztecan into southern California, thus displacing some Hokan groups to the north of this intrusion and others to the south. The tip of this Takic "wedge" is represented by the Southern

Channel Islands, while its base occupies a broad expanse of the arid-lands of eastern California south of the Sierra Nevadas (see Moratto 1984:549-557).

The timing of this intrusion has long been a central point of debate. Moratto (1984:164-165), for instance, cites various archaeological studies that date the arrival of Takic peoples between 1500 BC and 1400 AD, concluding only that Uto-Aztecan expansion in California most likely occurred sometime before 2000 BC (Moratto 1984:559). Koerper (1979:70) offers a somewhat similar time range for the arrival of Takic peoples in southern California, from as early as 4000 BC and as late as 700 AD. The younger end of this spectrum is represented by reconstructions such as the following:

> "As for the timetable of Takic expansion into southwestern California, Kowta (1969:50) proposed dates of ca. 1000 BC for the entry of "Shoshoneans" into the Los Angeles Basin and 700 BC for their appearance on the southern Channel Islands. This chronology is consistent with archaeological evidence that the ancestral Gabrielino, Tataviam and Northern Serrano—all Takic groups—had occupied their respective territories by the end of the Early Period, that is, circa 1500-1200 BC" (Moratto 1984:560).

The OGR bead data suggest that this scenario greatly underestimates the age of a Uto-Aztecan linguistic frontier in the southern Channel Islands and, by logical implication, of the expansion of a Takic linguistic area in California as a whole. We agree with Vellanoweth (1995) that the OGR bead data suggest a Takic presence in coastal southern California at least a millennium earlier than some previous estimates. It should also be pointed out that this scenario does not imply any sort of monolithic Uto-Aztecan cultural development. Uto-Aztecan linguistic history may well be quite complex, conceivably involving population movements in and out of California and portions of the Great Basin, as well as related socioeconomic trends (Young and Bettinger 1992).

Viewed from the perspective of the model presented here, the "Shoshonean Wedge" problem cannot be solved by focusing on a single region. If the OGR beads mark a middle Holocene Uto-Aztecan linguistic frontier, the southern California "Wedge" merely represents the southern flank of a much more extensive cultural interaction network spanning large areas of California and the Great Basin. While future research in California and the Great Basin will be conducted at the regional level owing to both intellectual and logistical factors, it may be productive to design some aspects of these studies with a more trans-regional perspective in mind:

1) At present, the differential distribution of OGR beads in relation to the postulated frontier is quite striking. However, the present sharpness of this boundary as indicated by OGR bead distribution is almost certainly artificial. OGR beads are rare throughout their range and this fact has thus far worked against accumulating a large number of data points with which to estimate inter-regional frequency. It is also unrealistic on logical grounds to expect a linguistic boundary to be "impermeable" to the movement of various kinds of materials, including beads. For these reasons, we would expect to find OGR beads on both sides of any linguistic frontier. The model presented here does not predict an absence of OGR beads outside of the Uto-Aztecan area; rather, it predicts significantly higher frequencies within this area. Future research can seek to test this implication by identifying and dating OGR beads in regions of California and the Great Basin that adjoin the postulated frontier.

2) Are there other classes of "material culture" whose analysis might reveal a Uto-Aztecan frontier? One premise of our model is that artifact style may play an important role in the social relations of hunter-gatherers, where style is defined as "formal variation in material culture that transmits information about personal and social identity" (Weissner 1983:256). In the present case, we suggest that OGR beads may be an archaeological correlate of a system of prehistoric social relations mediated by linguistic affinities. If such a system did exist, it seems logical to expect its imprint on other classes of material culture as well. In fact, there are data that may point to this conclusion. One example is provided by Connolly et al. (1995:315), who observe differences in prehistoric basketry-manufacturing techniques between the southern and northern Channel Islands:

> "...technological differences are evident in twined basketry from California's northern and southern Channel Islands. These differences appear to correspond to a linguistic and cultural boundary between the Hokan-speaking Chumash to the north and the Uto-Aztecan-speaking *Tongva* (Gabrielino) to the south. Twined basketry and cordage from the southern islands (San Nicolas, Santa Catalina and San Clemente) were made primarily with S-twist wefts and cords, while twineware and cordage from the northern islands (Anacapa, Santa Cruz, San Miguel and Santa Rosa) were made primarily with Z-twist techniques."

In that basketry has been recovered from many areas of California and the Great Basin, an analysis of basketry in a trans-frontier context may be revealing as regards linguistic geography. Other classes of artifacts that are similarly widespread and potentially informative about stylistic variation, such as stone tools, are a logical target of investigation. Here, it may be of interest to note that Macko (1998:114-118) reports at least one undated OGR bead from recent excavations at site CA-ORA-64 in Orange County,

California, as well as carefully worked stone balls (also undated) similar to specimens reported for the OGR-bearing sites in Oregon reported by Jenkins and Erlandson (1997). Once again, these results hint at a greater degree of sharing of distinctive artifact types or styles between southern California and the Great Basin than previously recognized.

3) Figure 1B offers some interesting hints regarding environmental factors and a Uto-Aztecan linguistic frontier. Examination of this figure shows that the currently known distribution of OGR beads is co-extensive with the western margin of the Basin and Range Province (indicated by solid line in Figure 1B). In this regard, Moratto's (1984:544-549) suggestion that increasing aridity during the middle Holocene Altithermal may have influenced the spread of a PUA stock within the arid lowlands of California and Great Basin is interesting. One might hypothesize that OGR beads not only were transported in a cultural sphere consisting of related languages but also within a continuum of related techno-environmental adaptations. The "Shoshonean Wedge" area discussed earlier could be viewed as a physiographic corridor between the arid lowlands of eastern California and the Great Basin and coastal southern California (Figure 1B). Patterns of this kind suggest that it may be profitable to frame research along a Uto-Aztecan linguistic frontier in terms of a continuum of shared techno-environmental adaptations, including exploitation of aquatic resources.

4) Finally, future research requires greater communication between California and Great Basin archaeologists, a point emphasized by Jenkins and Erlandson (1997). Perhaps the foregoing discussion will usefully influence the design of future studies. It is entirely conceivable that the data needed to test the model presented here, including information from OGR beads as yet unstudied, already exist in archaeological collections across California and the Great Basin. What is currently lacking is the appropriate "search images" required to recognize and link these data into meaningful patterns. If our discussion of a possible middle Holocene linguistic frontier helps to form such an image, it will have met its intended purpose.

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