SDI-4553, Major Shellfish Genera and Prehistoric Change on the San Diego County Coast

Don Laylander and Dave Iversen

Abstract

SDI-4553 is a small Middle to Late Holocene shell midden near San Elijo Lagoon on the central San Diego County coast. Within the site are three distinct areas where *Chione* (venus clam), *Donax* (bean clam), and *Pseudochama* (Pacific jewelbox) were processed. Considered within a regional context, the changing patterns in the major genera of shellfish that were exploited at SDI-4553 suggest insights into changes in the region's natural environment and in its prehistoric inhabitants' cultural strategies of adaptation.

The Site

SDI-4553 functioned prehistorically as a small shellfish processing station. It is situated on a bench on the side of a marine terrace overlooking the northern shoreline of San Elijo Lagoon, in Encinitas, California. ASM Affiliates conducted test excavations at the site for the California Department of Transportation in 2002 and 2006 (Laylander 2006; Laylander and Becker 2004).

The excavation sample of a total of 12 square meters at the site recovered 8,103 grams of marine shell, amounting to a moderate average density of 675 grams per square meter. Apart from marine shell, only sparse cultural remains were found, including single fragments of a mano and a metate, four cores, 60 pieces of flaked lithic debitage, four brownware sherds, and less than 3 grams of animal bone. The deposits were fairly shallow; although shell was present as deep as 100 centimeters below the surface, 90 percent of the shell came from the upper 50 centimeters. There was no evident vertical patterning in the physical stratigraphy of the site or its cultural deposits; postdepositional bioturbation was undoubtedly responsible for the site's depth.

Among the numerous shell middens that once lined San Diego's coast, SDI-4553 is noteworthy for two things. One is the strong horizontal differentiation in the major genera of shellfish contained within the site's fairly small space (about 3,000 square meters) (Fig. 1). The other is the particular identity of those major genera: *Chione, Donax*, and *Pseudochama*. (In this discussion, a "major" constituent is considered to be one that accounts for more than 10 percent by weight of an assemblage's shell. A "minor" constituent represents 1–10 percent, and a "trace" constituent represents less than 1 percent.)

In the western portion of the site, the predominant genus is *Chione* (venus clam), which accounted for 93 percent of the identifiable shell from this area (Table 1). Two radiocarbon dates were obtained from bulk samples of *Chione* shell: conventional

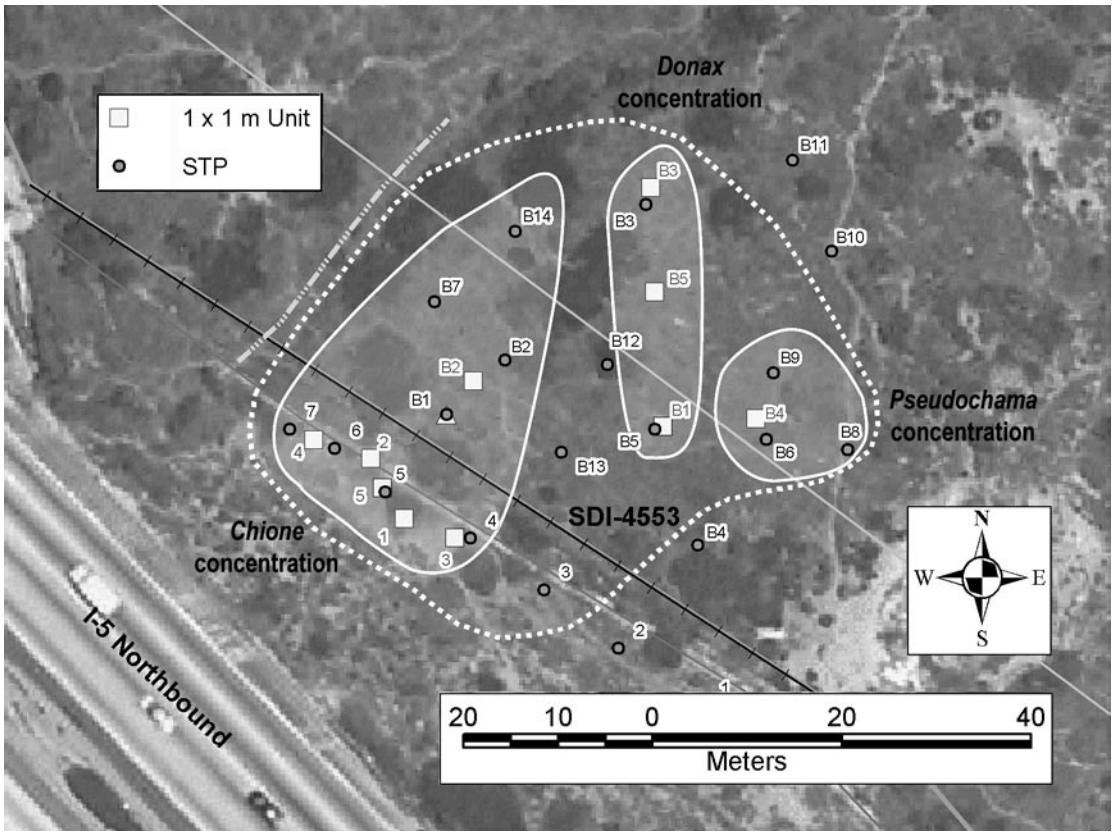

Fig. 1. Map of SDI-4553, showing the Chione, Donax, and Pseudochama areas.

radiocarbon ages of 2610 ±70 RCYBP (Beta-173364) and 4420 ±40 RCYBP (Beta-213736). Calibrated and corrected for the marine reservoir effect, these correspond to two-sigma ranges of 359 BC–AD 141 and 2671–2024 BC respectively.

The central portion of SDI-4553 is dominated by the shell of *Donax*, the small bean clam. More than 97 percent of the shell recovered from this area was *Donax*, which accounted for more than half of the shell recovered from the site as a whole. A bulk sample of *Donax* shell produced a radiocarbon date of 1010 ±40 RCYBP (Beta-213735), corresponding to a two-sigma range of AD 1357–1680.

In the site's eastern corner, the predominant type of shell is *Pseudochama exogyra* (Pacific jewelbox). *Pseudochama* made up more than 98 percent of the shell in this area. A radiocarbon date of 830 ±50 RCYBP (Beta-213737), or AD 1497–1955, was obtained for a bulk sample of *Pseudochama* shell.

Regional Comparisons

The significance of the shellfish genera that were identified at SDI-4553 becomes clear only when they are considered within a wider regional context. To present that context, we have collected a grab-bag sample of archaeological analyses of other shell midden sites in western San Diego County, primarily from the unpublished gray literature. To be included in the sample, an analysis had to include at least 3,000 grams of shell sorted to the genus or species level. Our sample of

Table 1. Identified marine shell recovered at SDI-4553, by shellfish taxon and portion of site.

Taxon	Habitat*	Portion of Site				Total Weight	Percent
		Western	Central	Eastern	Other		
Donax	S	17.0	4122.8	0.4	0.1	4140.3	53.7
Chione	L	1718.5	16.4	4.9	2.1	1741.9	22.6
Pseudochama	R	59.8	39.9	1605.4	-	1705.1	22.1
Megastraea	R	2.6	20.8	12.2	-	35.6	0.5
Saxidomus	S, R	-	29.0	-	1.5	30.5	0.4
Neverita	L	11.8	-	-	-	11.8	0.2
Ostrea	L	8.3	2.0	1.5	-	11.8	0.2
Argopecten	L	4.6	0.5	-	-	5.1	0.1
Vermitidae		-	-	4.9	-	4.9	0.1
Macoma	L	3.8	-	-	-	3.8	0.1
Protothaca	R, L	0.8	2.0	-	-	2.8	0.0
Mytilus	R	1.4	1.3	-	-	2.7	0.0
Tivela	S	-	2.3	-	-	2.3	0.0
Megathura	R	-	-	2.3	-	2.3	0.0
Ischnochiton	R	-	0.5	1.0	-	1.5	0.0
Tagelus	L	-	0.9	-	-	0.9	0.0
Olivella	S, L	-	0.6	-	-	0.6	0.0
Total		1828.6	4239.0	1632.6	3.7	7703.9	
g/sq.m excavated		261.2	1304.3	1187.3	9.9	642 .0	

* S = sandy open coast; L = bay/lagoon; R = rocky open coast

such analyses is by no means exhaustive, nor is it necessarily statistically representative, but it includes a reasonably full range of geographical and chronological contexts within the region (Fig. 2).

Five genera of mollusks account for most of the shell that has been found at western San Diego County sites: *Chione, Argopecten, Mytilus, Ostrea*, and *Donax* (Fig. 3). These genera differ in the natural environments where they occur and in the chronologies of their prehistoric exploitation (Fig. 4).

Chione (venus clam, *C. undatella, C. fluctifraga,* and *C. californiensis*), a bay/harbor clam, is the taxon most abundantly represented in San Diego County middens. Although particularly characteristic of Middle Holocene deposits, it is also well represented in Early Holocene components and at those Late Holocene sites in locations where lagoon resources continued to be available (e.g., Laylander and Becker 2004).

Argopecten aequisulcatus (speckled scallop) is another bay/lagoon shellfish. It closely matches *Chione* in its archaeological distribution. However, *Argopecten* seems to be a little more common in earlier or stratigraphically lower deposits (Fig. 5).

Mytilus (mussel; *M. edulis* and *M. californiensis*) provides a notable contrast with *Chione* and *Argopecten*. Its habitat is open coast areas with rocky substrates, rather than bays or lagoons. Archaeologically, *Mytilus* seems to be most

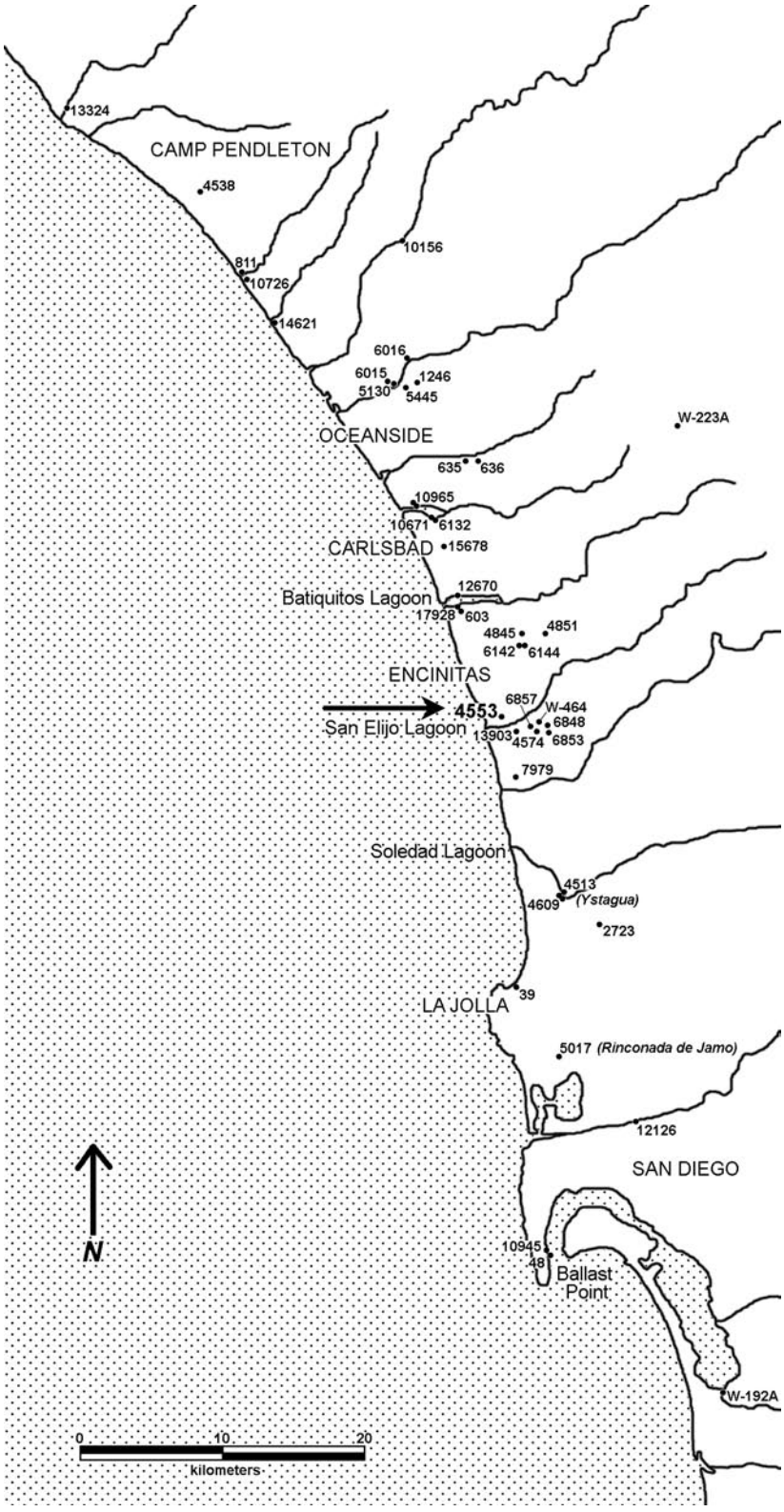

Fig. 2. San Diego shell midden sites in the comparative sample.

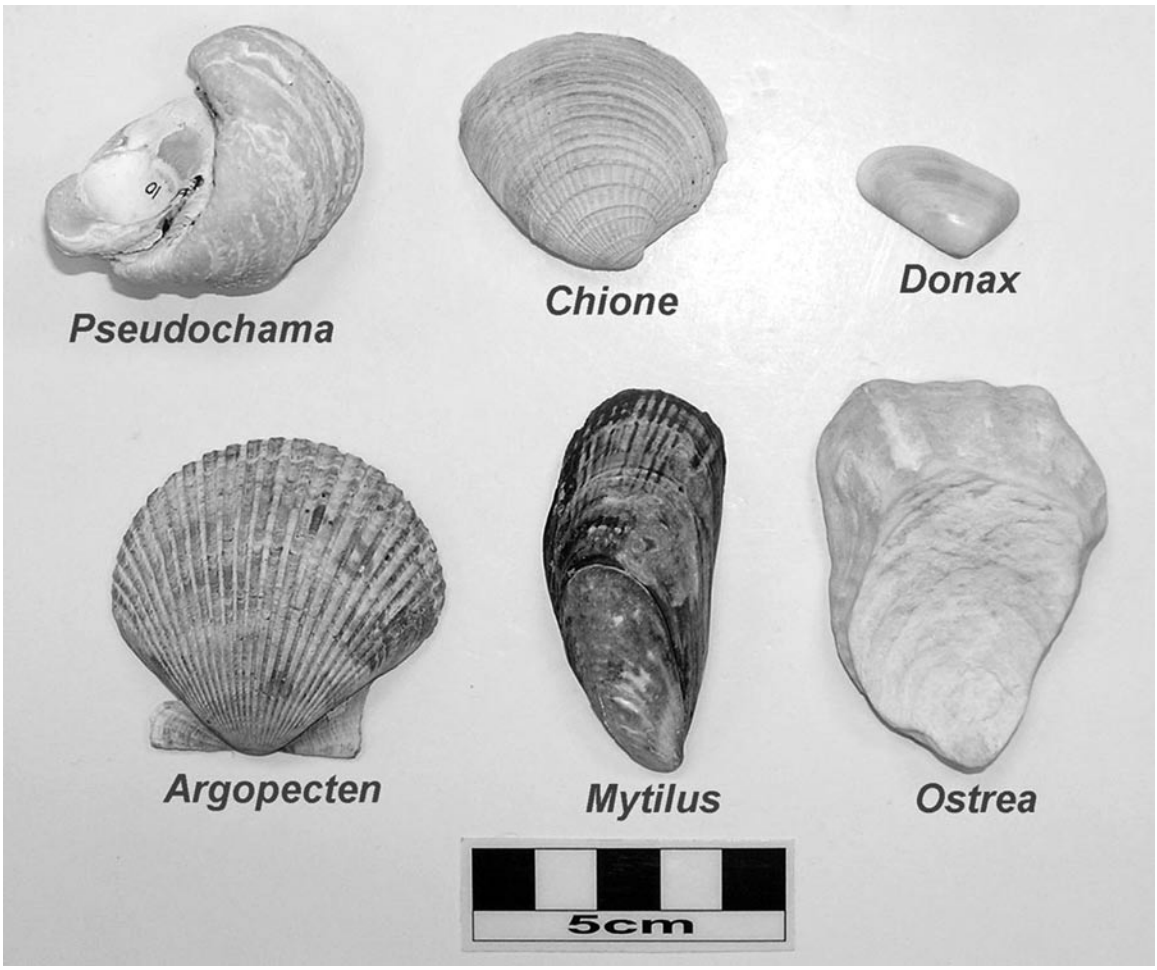

Fig. 3. Specimens representing the five major shellfish genera and Pseudochama.

abundant in Early Holocene deposits (e.g., Laylander and Becker 2004). Its subsequent decline during the Middle Holocene may reflect a loss of rocky shoreline, as the post-Pleistocene sea level stabilized, eroding away cliffs and building up beaches. An alternative hypothesis is that *Mytilus* may have been a favored resource that was overexploited during the early period.

Ostrea lurida (Olympia oyster) is a third bay/lagoon species, although one that is considerably less abundant in most middens than either *Chione* or *Argopecten*. *Ostrea* seems to occur slightly more frequently in earlier deposits than in later ones.

Donax (bean clam; *D. gouldii* and *D. californicus*) presents some notable contrasts with the other four major mollusk genera. Its natural habitat is open coastlines with sandy beaches. Although the shell is present in trace amounts within early middens, focused exploitation of *Donax* seems to have been characteristic only during the Late Holocene. Geographically, *Donax* middens are found primarily on the northern San Diego coast,

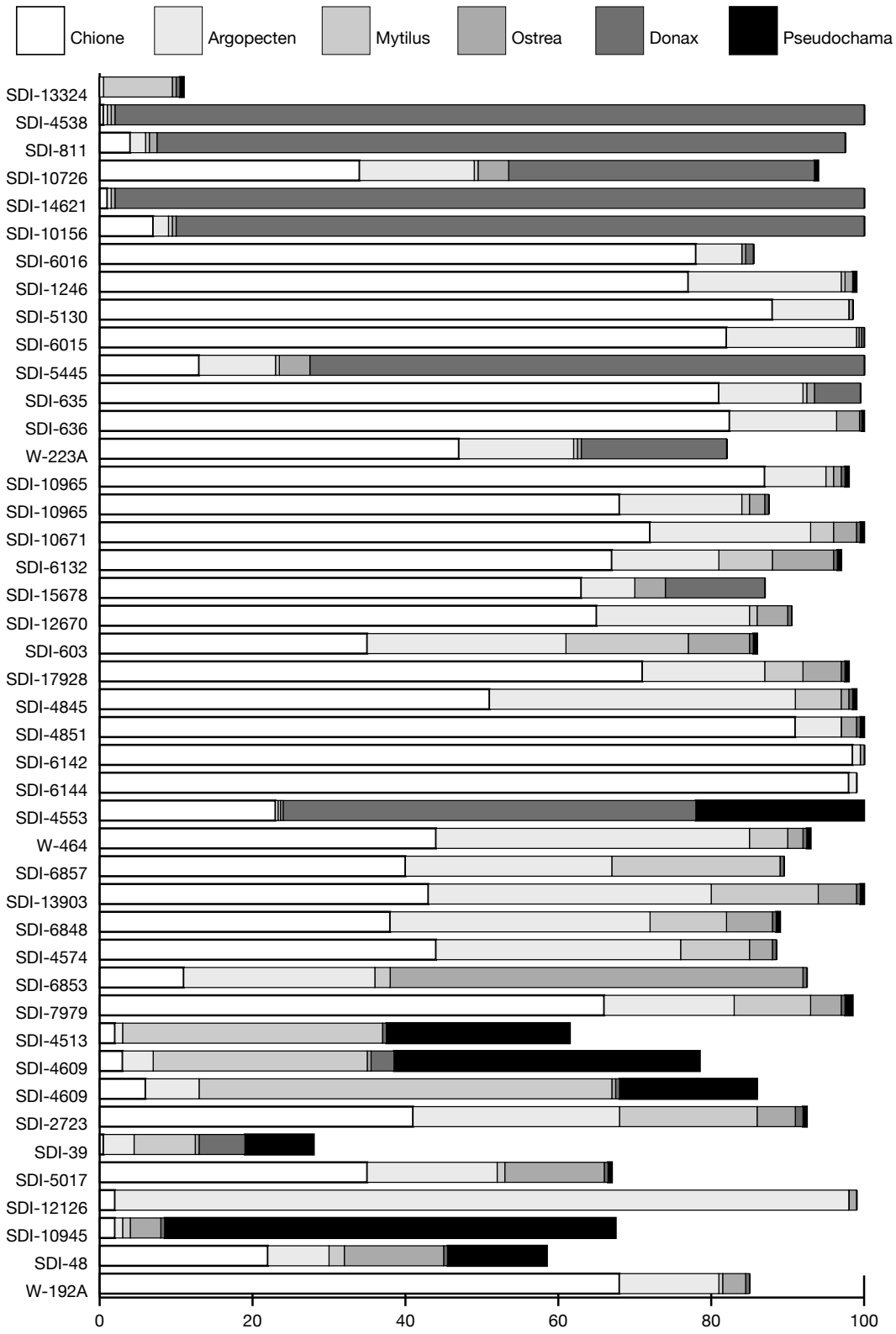

Fig. 4. Proportions of major shellfish genera at selected San Diego sites (generally ordered from north to south).

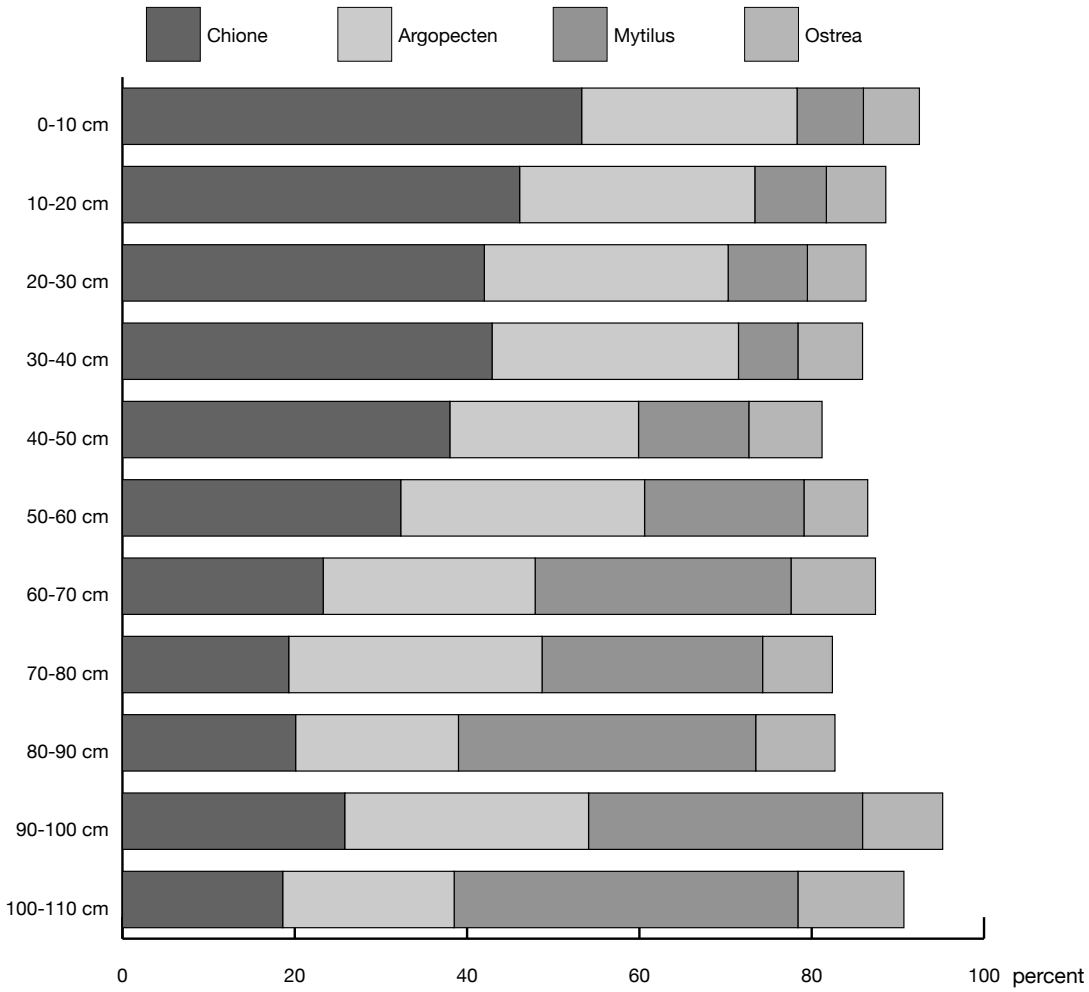

Fig. 5. Vertical patterning in major shellfish genera at SDI-603, an Early-Late Holocene deposit on Batiquitos Lagoon (Laylander and Becker 2004:47).

around Oceanside and at sites in present-day Camp Pendleton, although they have occasionally been reported farther south, for instance at SDI-15678 in Carlsbad (Laylander and Becker 2004), at SDI-11075 in La Jolla (Masters 2003), and at SDI-4553. Possible explanations that have been suggested for the unique distribution of *Donax* in space and time include environmental change (the decline of the lagoons and the growth of sandy beaches), technological change (the availability of pottery vessels for cooking), seasonal scheduling, and cultural choice (Byrd 1998:211–214; Laylander and Saunders 1993; Rosenthal, Hildebrandt, and King 2001).

Several other genera occasionally appear as major constituents in substantial San Diego middens. In our comparative sample of analyses, these include *Pseudochama*, *Tivela* (Pismo clam), *Saxidomus* (Washington clam), *Protothaca* (Pacific littleneck), and *Tegula* (top shell).

Pseudochama, like *Mytilus*, lives on open coasts with rocky substrates. Trace amounts of *Pseudochama* shell are found in many San Diego County middens, but it rarely amounts to a major or even a minor constituent. In addition to SDI-4553, two other areas in our sample reported *Pseudochama* (or its easily mistaken sister genus, *Chama*) as a major constituent. One is Ballast Point (sites SDI-48 and SDI-10945), at the entrance to San Diego Bay (Gallegos and Kyle 1988; Pigniolo et al. 1991). The second was the ethnohistoric Ipai village of *Ystagua* (sites SDI-4513 and SDI-4609) near Soledad Lagoon (Carrico and Taylor 1983; Hector 1985; Hector and Wade 1986).

Many other genera contributed shell in minor or trace amounts to San Diego County shell assemblages. The shell sample from SDI-4553 included 14 trace taxa (among which were *Argopecten, Ostrea*, and *Mytilus*). It is not uncommon for analyses of large shell samples to report two dozen trace constituents. In more than 170,000 grams of shell analyzed from SDI-48 at Ballast Point, 36 different taxa were identified (Gallegos and Kyle 1988:9–37). While pelecypods (bivalves) from bay/lagoon habitats typically dominate most assemblages by weight, the highest counts of different genera are often represented by open-coast, rocky-substrate gastropods (marine snails). In future studies, it may be rewarding to investigate the diversity and identity of these trace constituents. For instance, to try to determine whether they were accidental or opportunistic byproducts of major-constituent harvesting, or whether they were objects of purposeful but quantitatively limited exploitation.

Interpretations

The three major shellfish genera found at SDI-4553 may be considered in the context of regional patterns in shellfish use. These offer some evidence concerning paleoenvironmental change, prehistoric settlement patterns, and strategies of resource exploitation.

The sizeable amount of *Chione* shell at the site comes as no surprise, given the general abundance of the genus in prehistoric middens, particularly those in lagoon settings. The radiocarbon dates on *Chione* shell at SDI-4553 indicate that at least as late as the final centuries BC, San Elijo Lagoon was still an open, productive lagoon, rather than a silt-clogged marsh. On the other hand, the subsequent occupants' focus on open-coast genera—*Donax* and *Pseudochama*—suggests that at some point prior to AD 1680 at the latest, San Elijo Lagoon had ceased to offer its resources for shellfish collecting. A series of radiocarbon-dated deep sediment cores taken from San Elijo Lagoon has indicated that the lagoon gradually began to silt in around 1500 BC, but open conditions existed as late as AD 1300 in the lower portion. The lagoon has undergone various stages of siltation through the Late Holocene period, with a smaller, closed lagoon existing today despite modern modifications (Byrd, Pope, and Reddy 2004).

It is also worth evaluating the choice of SDI-4553 as a location to process shellfish. During its early, *Chione*-focused phase, the choice of location seems fairly logical, with the lagoon lying only a few hundred meters to the south. However, during the site's later, *Donax-Pseudochama* phase, SDI-4553 was at least 1.3 kilometers from the open coast where the shellfish could be collected. It would have been possible for the prehistoric collectors to process the shellfish at special-function sites directly on the coast, as seems to have been the practice at many *Donax* middens. Alternatively, the raw resources might have been carried inland to a semi-permanent village base for both processing and consumption, as, for example, seems to have been done with *Pseudochama* and *Mytilus* at the

village of *Ystagua*. The use of SDI-4553 as an intermediate, limited-function processing station provides some support for the hypothesis of a late prehistoric shift of most settlement bases eastward, away from San Diego County's coastal plain and toward new settings in interior valleys and the mountains of the Peninsular Range. Despite some notable exceptions, including the ethnohistoric villages of *Ystagua* and *Rinconada de Jamo*, other studies of archaeological site distributions suggest that there was a shift in settlement away from coastal sites occupied during the Middle Holocene to interior locations in the Late Holocene (e.g., Christenson 1992).

As noted, *Pseudochama* shell is common as a trace constituent in San Diego County middens, but it is rarely a major constituent. The reasons for this are not entirely clear. *Pseudochama's* sister genus, *Chama*, was a focus of prehistoric exploitation in Polynesia (Rehder 1981:728). *Pseudochama* is said to be delicious to eat but to offer only small packages of meat (Rehder 1981:731). It may be hypothesized that *Pseudochama* was a relatively inefficient resource to exploit, when the costs of its procurement and processing were set against its nutritional gains. If so, the coastal specialists of the Middle Holocene may have been aware of this unfavorable balance, but their more inland-oriented successors in Late Holocene times at SDI-4553 may have been less sophisticated and less selective in their shellfish collecting strategies.

Conclusions

Site SDI-4553 is a small, limited-function prehistoric shell midden near San Elijo Lagoon. Uncharacteristically, successive deposits of three different major shellfish genera were found in horizontally separate portions of this site, rather than being superimposed upon and mixed with each other. The three genera–*Chione, Donax*, and *Pseudochama*–represent resources from three distinct ecological settings: bay or lagoon, open sandy coast, and open rocky coast, respectively. The chronological succession of the three genera helps to date the late evolution of San Elijo Lagoon into a shallow marsh. It also suggests a shift in settlement patterns away from the coast toward villages based at inland locations during the final stages of prehistory. The focused exploitation of *Pseudochama* is unusual and may possibly point to the adoption of less sophisticated choices among littoral resources during the late period.

The scientific value of relatively small and uncomplicated archaeological sites is only likely to be fully realized when they are considered within their wider regional contexts. Anomalies in the patterns of shellfish exploitation at SDI-4553, as seen from such a perspective, provide suggestive evidence concerning changes in the natural environment and in settlement and subsistence strategies that occurred during the Late Holocene period.

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