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The Archaeology and Historical Ecology of Point Bennett, San Miguel Island, California

Final Report for Western National Park Association Grant

Prepared by:

Todd J. Braje, Ph.D.
Department of Anthropology
Humboldt State University
Arcata, CA 95521

and

Jon M. Erlandson, Ph.D.
Department of Anthropology
University of Oregon
Eugene, OR 97403-1218

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We are pleased to report the successful completion of our historical ecology study on western San Miguel Island, California, supported by our WNPA grant, *The Archaeology and Historical Ecology of Point Bennett, San Miguel Island, California*. We accomplished all of our research goals and made significant progress in better understanding the long history of human occupation of the Pt. Bennett area. This includes the sampling of several archaeological deposits, laboratory analysis of the excavated cultural materials, and radiocarbon dating of a number of recorded and newly recorded archaeological sites.

The primary goal of our WNPA project was to identify and sample Middle Holocene sites along the Pt. Bennett area of western San Miguel Island to help fill chronological gaps in an archaeological sequence in the area that spans from about 10,200 years ago to the 20th century (Figure 1). To complete the Point Bennett sequence, additional fieldwork to gather radiocarbon samples, collect faunal data, and map the area was necessary. Our dating and subsurface excavations focused on filling the larger gaps (~8500-5850 and 4800-3200) in the chronological sequence from the area. Therefore, we identified and targeted a number of undated archaeological localities as the focus of our research. Finally, we also obtained additional radiocarbon dates from previously dated localities to help better understand the history of human settlement and ecological changes in the area.

During the first week of January 2009, Braje and Erlandson, along with marine biologist Robert DeLong, a small field crew, and Native Chumash monitor, conducted a research trip to San Miguel Island and the Pt. Bennett area. During this research trip we finished collecting radiocarbon samples from several undated sites along northeastern and northwestern Pt. Bennett and along the rim overlooking Pt. Bennett. We also recorded a number of new prehistoric sites within these areas. We collected a variety shellfish samples from sites with a high degree of

research potential and sent samples for high-precision AMS radiocarbon (^{14}C) dating at Woods Hole Oceanographic Institution and conventional radiocarbon dating at Beta Analytic (Table 1). We also sampled, mapped, and ^{14}C dated two unique Middle Holocene sites, CA-SMI-575 and CA-SMI-527 (Figure 2).

CA-SMI-575 is a large archaeological site situated on the bluffs overlooking Point Bennett. The site caps a broad Pleistocene dune ridge extending from approximately the northwest coast to the steep 100 meter high escarpment overlooking the southwest coast. Several distinct loci have been recorded within this roughly kilometer long site, and ^{14}C dates demonstrate that the site was occupied during the Early, Middle, and Late Holocene.

The east-central potion of the site contains four loci of high-density *Tegula funebralis* (black turban shell) middens aligned along an old dune ridge running northwest to southeast (Figure 3). The larger *Tegula* midden at CA-SMI-575 encompasses an area roughly 100 meters long and about 25 meters wide. All four loci, between 15 and 30 cm thick, are contained in the same sandy soil matrix overlying the older Simonton Soil, and separated by 20-40 meter gaps where the dune soil has been lost to erosion and scattered artifacts lie on deflated soil or caliche surfaces. Each of the midden loci are dominated by broken black turban snail shells, with smaller amounts of red abalone, owl limpet, land snail, and other shells also present. At each locus, we observed several pitted stones and hammer stones, likely used for processing black turban snails during meat extraction. Well preserved California mussel shell fragments from three of the intact *Tegula* midden loci at CA-SMI-575 were ^{14}C dated via Accelerator Mass Spectrometry and the calibrated age ranges all overlap at approximately 6100 cal BP (Table 1). These dates, along with the consistency in site stratigraphy, structure, and contents, suggest that the relatively large *Tegula* midden at CA-SMI-575 represents a single occupation. Due to severe soil erosion, which

continues to gradually destroy the midden loci, it was not possible to determine if the four existing loci were once part of a single continuous shell midden. However, the presence of pitted stones and other artifacts in the deflated areas between the intact midden loci suggests that this may be the case.

CA-SMI-527 is a large archaeological site approximately 250 meters long by 70 meters wide. The site is exposed atop and within a large sand dune oriented northwest to southeast along the north-central part of the Point Bennett area. Dense shell midden with abundant bone and lithic material is cascading down the eastern and northern exposures of the dune and exposed in blown-out dune pockets along the southern exposure. We recorded several distinct loci of dense shell midden eroding from discrete anthropogenic soils at different levels within the sand dune. Concentrating our radiocarbon sampling on the exposed and actively eroding north-facing loci in the northern site area, we identified discrete shell middens associated with Early, Middle, and Late Holocene occupations. The Middle Holocene and stratigraphically intermediate midden, dated to approximately 5100 cal BP, was approximately 40 cm thick and is visually dominated by black turban snail shells with lesser amounts of large red abalone, black abalone, owl limpet, and California mussel shells (Figure 4). This *Tegula* midden is exposed at the northern margin of the dune, about 40 meters above sea level, and is only visible for about 5 meters along the dune face. It is likely that this Middle Holocene midden component is considerably larger, but its dimensions are impossible to determine without significant subsurface probing and excavation.

In response to severe site erosion, we collected ^{14}C and bulk samples to determine the age of the *Tegula* middens and quantify the shellfish constituents present within them. At CA-SMI-575, we excavated Bulk Sample 1 from the southernmost *Tegula* midden, the densest and best preserved of the four loci. Due to the logistical difficulties of working on San Miguel Island and

the conservation ethic within Channel Islands National Park, the bulk samples were limited to a volume of 20 liters, taken from actively eroding exposures at each site. The small size of the bulk samples limits their utility for documenting vertebrate or artifactual remains, although extensive eroding site exposures allowed us to document some of these associated materials. The midden deposits at both localities were visually dominated by black turban shells and we collected the bulk samples from areas that appeared to be representative of the larger site constituents. Despite the small volume excavated, we recovered roughly 9 kg of marine shell from the two bulk samples.

All excavated sediments were screened in the field over 1/16-inch mesh and the residuals were returned to Humboldt State University for analysis. In the lab, residuals were washed and screened over 1/8-inch mesh to facilitate sorting and sampling. The 1/8-inch fraction was completely sorted, with all artifacts and ecofacts identified to the most specific taxonomic level possible. The 1/16-inch fraction, which made up a relatively small portion of the well-preserved assemblage, was rough-sorted for artifacts and other diagnostic material. A 30 gram sample of the 1/16-inch mesh was fully sorted and consisted mostly of tiny fragments of black turban shell, sea urchin spines, California mussel shell, and undifferentiated shell.

Both shellfish and vertebrate remains recovered were identified, then quantified by weight and minimum number of individuals (MNI). To provide comparative data on the importance of various faunal classes to the diet of the site occupants, dry shell weights were multiplied by meat conversions to estimate the edible meat represented by the recovered shellfish remains (see Braje 2009; Erlandson 1994; Rick 2007). Vertebrate remains are also reported for both samples, but these should not be considered representative of the larger midden constituents.

In Bulk Sample 1 at CA-SMI-575, we recovered nearly 5.5 kg of marine shell, but vertebrate remains were limited to just 0.3 g of unidentified fish bone. Over 98 percent of the shell was identifiable to at least a general taxon, with most to the species level. The shellfish assemblage included 17 different shellfish taxa (Table 2). Most of these taxa live in rocky intertidal habitats, which still make up about half of San Miguel Island's coastline today. Consistent with field observations, black turban snail dominates the assemblage, contributing 68.4 percent of the dry shell weight and 56.2 percent of the MNI. California mussel is the next most abundant shellfish species by weight (18.3%) and the third most abundant by MNI (11.5%). Red abalone, owl limpets, and black abalone are also present but never make up more than 4.7 percent of the shell weight. Several minor species (especially very small barnacles, limpets, and gastropods) appear to be incidental midden constituents, probably "riders" introduced as epifauna attached to abalones, mussels, or seaweeds (see Jones and Richman 1995). The most abundant of these non-dietary shellfish types are tiny limpets and slipper shells, with a combined total of 323 individuals representing over 27 percent of the MNI.

Bulk Sample 1 at CA-SMI-527 produced over 3.5 kg of marine shell and much smaller amounts of fish bone (6.3 g) and undifferentiated mammal bone (0.3 g; Table 3). Fifteen shellfish taxa were identified from our zooarchaeological analysis, with over 98 percent of the assemblage identified to a general taxon and most to the species level. Similar to the CA-SMI-575 sample, the faunal assemblage recovered from CA-SMI-527 is dominated by rocky intertidal shellfish species with black turban snail shells comprising 48.6 percent of the dry shell weight and 61.1 percent of the MNI. California mussel (18.3%), red abalone (17.1%), and black abalone (7.8%) shell are the next most abundant species by weight, with sea urchin shell (4.2%) the only other species comprising more than one percent of the dry shell weight. Slipper snail shells and

small limpets comprise a relatively large percentage of the MNI, but were probably not targeted for dietary consumption.

To better understand the importance of various food resources to the ancient site inhabitants, we estimated the edible yields represented by the dry shell weight for the major edible shellfish taxa. Since different shellfish and other animals have dramatically different ratios of edible meat to skeletal weights, a number of studies have been conducted to estimate the edible meat represented by discarded shell and bone. To transform dry shell and bone weights to edible meat values, we used meat weight multipliers derived from experimental work (see Braje 2007:87-89 for detailed discussion and references). While this method has problems (see Erlandson 1994; Reitz and Wing 1999), used appropriately in combination with other zooarchaeological methods (weight; MNI) it provides more reliable estimate of the dietary significance of major edible shellfish species -- especially when analyzing a well-preserved faunal assemblage processed over fine mesh.

Our dietary reconstructions for the CA-SMI-575 (Table 2) and CA-SMI-527 (Table 3) samples illustrate the importance of these conversions. At both sites, the dietary importance of red and black abalone increased significantly. After meat weight conversions at CA-SMI-575, black turban snails remain the single-most important resource, but their estimated contribution declines from 68.4 percent of the dry shell weight to 56.2 percent of the total shellfish meat yield. California mussels also decline in importance to 11.5 percent of the estimated edible meat yield from 18.3 percent of the shell weight. The apparent dietary significance of red abalone, black abalone, and owl limpets increases from 4.7, 1.5, and 2.3 percent of the total weight to 15.0, 3.4, and 7.4 percent of the estimated edible meat yield, respectively.

At CA-SMI-527, dietary reconstructions yielded even more dramatic changes in the relative important of the site constituents. After shell-to-meat weight conversations, black turban snails continue to be an important resource, but shift to the second most abundant meat contributor (30.6%), following red abalones which provide 40.1% of the estimated meat yield, an increase of over 20 percent increase from the dry shell weight yield. California mussel declines in importance from 18.3 percent to 9.4 percent. Black abalone increases from the fourth most abundant species calculated by dry shell weight (7.8%) to the third highest contributor of dietary meat (12.7%).

We also collected a small bulk sample from an eroding Early Holocene shell midden at the northeast end of SMI-527, and excavated a 1 x 1 meter wide test unit in a newly recorded Early Holocene site, CA-SMI-693, exposed by recent dune erosion in upper Adams Cove. These Early Holocene midden samples, analyzed at the University of Oregon by trained undergraduate and graduate students, were both dominated by California mussel (*Mytilus californianus*) shells, with smaller quantities of black abalone (*Haliotis cracherodii*) and other rocky shore shellfish. The results of our analysis of a 9000 year old midden sample from CA-SMI-527N have been accepted for publication in the journal *Current Research in the Pleistocene* (Erlandson et al. 2009).

Our initial results demonstrate the local variation inherent in coastal foraging strategies, even in a relatively homogenous and circumscribed environment. While this piece of our study is consistent with the general subsistence patterns on the Northern Channel Islands during the Middle Holocene, the focus on black turban snails is two Middle Holocene sites is a rather unique phenomenon along the Santa Barbara Channel and seems to be restricted to the Pt. Bennett area. These results have, thus far, been reported as a poster presentation at the Society

for California Archaeology Meetings (March 2009) by Braje and his Humboldt State students and will be published in the conference proceedings. In addition, a more detailed academic journal article by Braje and Erlandson (2009) is in review at *California Archaeology* and a second paper is in press at *Current Research in the Pleistocene*.

In total, WNPA funding has helped us produce a high-resolution archaeological and paleoecological data set from western San Miguel Island that spans the Holocene, dating from approximately 10,200 until 50 years ago. These data provide invaluable archaeological, paleoecological, and historical information for the National Park Service, scientists, resource managers, and other researchers. This work has contributed to our understanding of the history of human use of the western shore, the historical ecology of its unique ecosystems, and the impacts that humans have had on them. It also lays the foundation for further research on archaeological sites in the Point Bennett area, many of them threatened by severe erosion, work that will expand our knowledge of the deep history of marine populations and fisheries on western San Miguel Island.

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Figure 1. Map of the Santa Barbara Channel region and the Northern Channel Islands.

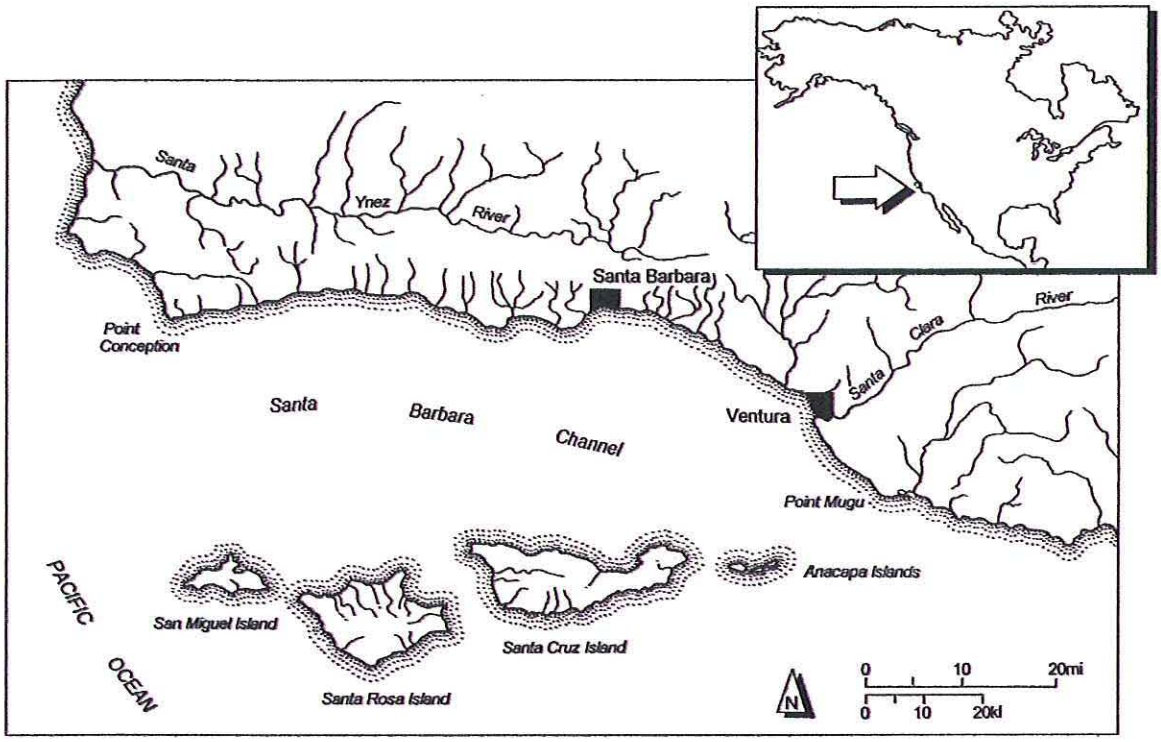

Figure 2. Locations of CA-SMI-575 and CA-SMI-527 on western San Miguel Island.

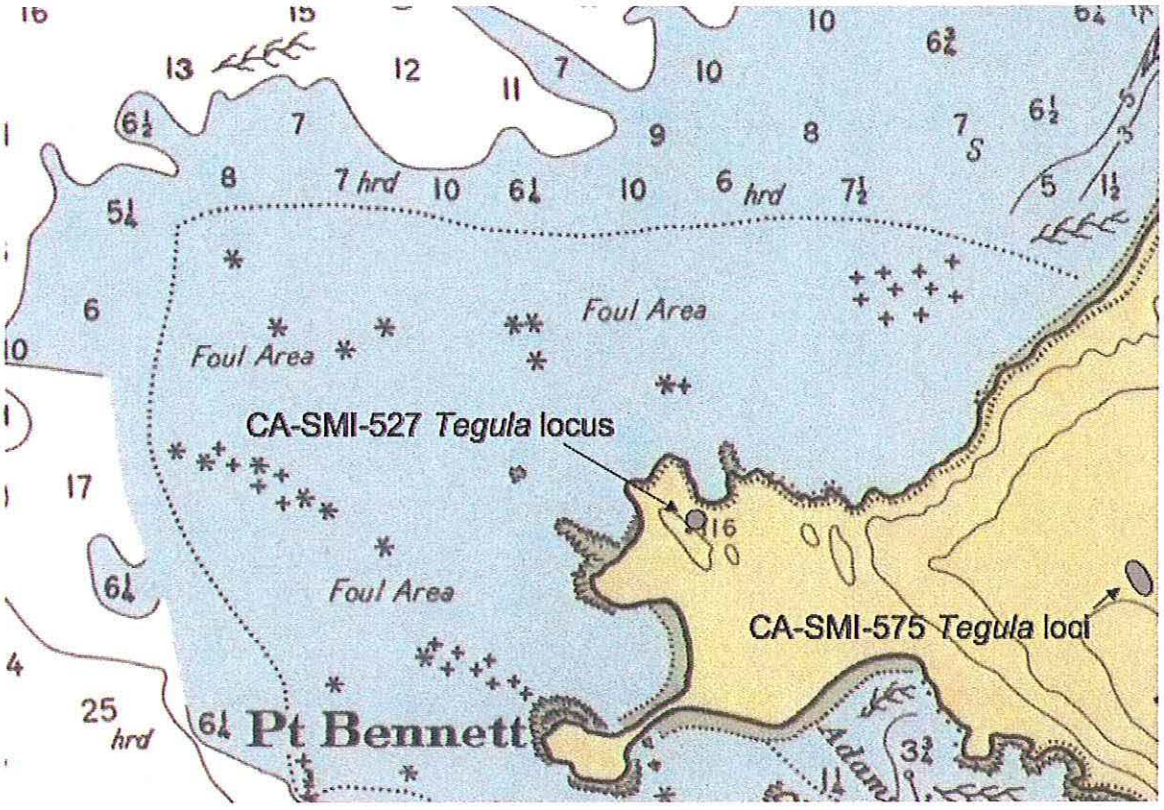

Figure 3. Overview of *Tegula* midden at CA-SMI-575, showing *Tegula* deposit in the foreground and individuals standing next to additional midden loci in the background.

Figure 4. Middle Holocene midden deposit at CA-SMI-527 prior to bulk sample excavation.

Table 1. Radiocarbon dates obtained archaeological sites in the Point Bennett area, western San Miguel Island.

Site	Provenience	Lab #	Material	Conventional ^{14}C Age	Age Range (cal BP, 1 sigma)[1]	Age Range (cal BP, 2 sigma)[1]
East Adams Pt	Simonton Soil	OS-73882	*M. californianus*	9490±60	10,190-9970	10,240-9860
NMFS-NW	Intact midden	Beta-261867	*M. californianus*	8120±40	8410-8310	8480-8220
SMI-523	Surface	OS-73884	Marine shell	5660±40	5880-5745	5920-5670
SMI-524N	House pit	Beta-218872	Marine shell	1570±70	960-790	1060-710
SMI-524S	30-45 cmbs	Beta-255082	Marine shell	1230±60	640-535	690-490
SMI-527	Base of Dune Top	Beta-218873	Marine shell	3040±50	2675-2480	2710-2365
SMI-527	*Tegula* midden	Beta-239249	*H. cracherodii*	5010±50	5190-4960	5250-4870
SMI-527	Abalone paleosol	Beta-218874	Marine shell	5730±60	5970-5790	6080-5710
SMI-527	1 m above Simonton soil	Beta-218875	*M. californianus*	8560±80	9020-8750	9130-8600
SMI-575	SE of trail	OS- 42695	*M. californianus*	1830±25	1230-1120	1260-1060
SMI-575	*Tegula* midden, North locus	OS-73883	*M. californianus*	5880±45	6150-5980	6190-5915
SMI-575	*Tegula* midden, Central locus	OS-73741	*M. californianus*	5950±35	6210-6060	6260-6000
SMI-575	*Tegula* midden, South locus	Beta-239250	*H. rufescens*	5830±70	6100-5910	6210-5840
SMI-575	Surface NE area	Beta-215313	*Saxidomus nutalli*	5710±40	5920-5780	5980-5720
SMI-575	EH soil NE area	Beta-216733	*M. californianus*	8190±80	8520-8350	8620-8230
SMI-693	Simonton Soil	Beta-255084	*M. californianus*	8150±100	8510-8290	8620-8160
SMI-693	Simonton Soil	Beta-255083	*M. californianus*	8540±50	8980-8780	9025-8640

Table 2. Faunal remains from Bulk Sample 1 at CA-SMI-575-South Locus *Tegula* Midden.

Faunal Type	Wt.(g)	Wt.%	Multiplier	Mt Wt.(g)	Mt Wt.%	MNI	MNI%
SHELLFISH							
Abalone							
Haliotis cracherodii/Black Abalone	83.7	1.5%	0.944	79.0	3.4%	3	0.3%
Haliotis rufescens/Red Abalone	256.7	4.7%	1.36	349.1	14.9%	3	0.3%
Haliotis spp./Nacre	22.8	0.4%	1.15	26.2	1.1%	--	--
Barnacle							
Balanus spp./Acorn Barnacle	41.0	0.8%	--	--	--	1	0.1%
Pollicipes polymerus/Gooseneck Barnacle	3.9	0.1%	--	--	--	1	0.1%
Other Bivalves							
Veneridae/Venus Clams	0.2	0.0%	--	--	--	2	0.2%
Chiton							
Chiton undif.	19.5	0.4%	1.15	22.4	1.0%	3	0.3%
Crab							
Cancer spp./Crab	10.4	0.2%	--	--	--	1	0.1%
Gastropods misc.							
Gastropods undif.	0.4	0.0%	--	--	--	7	0.6%
Helminthoglypta ayresiana/Land Snail	5.4	0.1%	--	--	--	9	0.8%
Limpets and Slipper Shells							
Crepidula spp./Slipper Shell	25.7	0.5%	--	--	--	204	17.2%
Fissurella volcano/Volcano Limpet	0.4	0.0%	--	--	--	1	0.1%
Lottia gigantea/Owl Limpet	126.9	2.3%	1.36	172.6	7.4%	12	1.0%
Limpet undif.	7.1	0.1%	--	--	--	119	10.1%
Mussel							
Mytilus californianus/California Mussel	997.0	18.3%	0.298	297.1	12.7%	136	11.5%
Septifer bifurcatus/Platform Mussel	1.4	<0.1%	0.364	0.5	<0.1%	2	0.2%
Serpulorbis squamigerus/Scaled Worm Shell	<0.1	<0.1%	--	--	--	1	0.1%
Strongylocentrotus spp./Sea Urchin	38.2	0.7%	0.583	22.3	1.0%	12	1.0%
Turban Shell							
Tegula brunnea/Brown Top	0.6	0.0%	--	--	--	1	0.1%
Tegula funebralis/Black Top	3731.1	68.4%	0.365	1361.8	58.2%	665	56.2%
Shell Nacre undif.	43.7	0.8%	--	--	--	--	--
Shell undif.	26.6	0.5%	--	--	--	--	--
Shell undif./Burned	15.6	0.3%	--	--	--	--	--
Shellfish Subtotal	5458.1	100.0%		2331.1	99.7%	1183	99.9%
VERTEBRATES							
Fish Bone	0.3	<0.1%	27.7	6.9	0.3%	1	0.1%
Vertebrates Subtotal	0.3	0.0%		6.9	0.3%	1	0.1%
TOTAL	5458.3	100.0%		2338.0	100.0%	1184	100.0%

Table 3. Faunal remains from Bulk Sample 1 at CA-SMI-527-North Locus *Tegula* Midden.

Faunal Type	Wt.(g)	Wt.%	Multiplier	Mt Wt.(g)	Mt Wt.%	MNI	MNI%
SHELLFISH							
Abalone							
Haliotis cracherodii/Black Abalone	276.9	7.8%	0.944	261.4	11.7%	6	1.1%
Haliotis rufescens/Red Abalone	605.0	17.0%	1.36	822.7	36.9%	3	0.5%
Haliotis spp./Nacre	29.9	0.8%	1.15	34.4	1.5%	--	--
Algae							
Corallinaceae/Coralline Algae	0.1	0.0%	--	--	--	1	0.2%
Barnacle							
Balanus spp./Acorn Barnacle	11.9	0.3%	--	--	--	1	0.2%
Pollicipes polymerus/Gooseneck Barnacle	0.4	0.0%	--	--	--	1	0.2%
Chiton							
Chiton undif.	1.5	0.0%	1.15	1.7	0.1%	1	0.2%
Crab							
Cancer spp./Crab	0.2	<0.01%	--	--	--	1	0.2%
Gastropods misc.							
Gastropods undif.	13.2	0.4%	--	--	--	2	0.4%
Helminthoglypta ayresiana/Land Snail	10.9	0.3%	--	--	--	12	2.2%
Limpets and Slipper Shells							
Crepidula spp./Slipper Shell	13.2	0.4%	--	--	--	87	15.7%
Lottia gigantea/Owl Limpet	16.3	0.5%	1.36	22.2	1.0%	2	0.4%
Limpet undif.	1.8	0.0%	--	--	--	16	2.9%
Mussel							
Mytilus californianus/California Mussel	648.7	18.3%	0.298	193.3	8.7%	35	6.3%
Septifer bifurcatus/Platform Mussel	0.7	0.0%	0.364	0.3	0.0%	5	0.9%
Strongylocentrotus spp./Sea Urchin	150.1	4.2%	0.583	87.5	3.9%	43	7.7%
Turban Shell							
Tegula funebralis/Black Top	1720.5	48.5%	0.365	628.0	28.2%	337	60.7%
Shell Nacre undif.	24.0	0.7%	--	--	--	--	--
Shell undif.	17.5	0.5%	--	--	--	--	--
Shellfish Subtotal	3542.7	99.8%		2051.6	92.0%	553	99.6%
VERTEBRATES							
Fish Bone	6.3	0.2%	27.7	174.0	7.8%	1	0.2%
Mammal Bone undif.	0.3	0.0%	17.1	5.1	0.2%	1	0.2%
Vertebrates Subtotal	6.6	0.2%		179.1	8.0%	2	0.4%
TOTAL	3549.3	100.0%		2230.6	100.0%	555	100.0%