Toward twigging the prehistory of Laguna Manuela, Baja California

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Archaeological studies along the eastern shore of Laguna Manuela in west-central Baja California have provided modest, incremental improvements to understanding the prehistoric human use of the lagoon, with implications for a broader region. About 500 to 2,000 years of prehistoric visits left evidence of a ribbon of closely-spaced, very temporary residential/activity loci relating to marine and, less intensely, terrestrial food searches and tool production, maintenance and, in cases, discard. The archaeological patterning shows differences compared to neighboring lagoons, indicating differing regional group visits with varying access to commodities such as obsidian and an absence of historic-period use.

Along the arid central Baja California coast of the Vizcaíno Desert lie a number of fisheries-rich lagoons that proved to be beacons for inland prehistoric hunter-forager peoples. The ethnographic record is somewhat vague on the use of these lagoons. Aschmann (1959:180), in his compilation of such records, notes that

> even the most productive shorelines of central Baja California did not support more than five persons per linear mile…. Shore resources added considerably to the carrying capacity of the land since they could be used more intensively in those seasons when land resources were critically short.

Jesuit missionary Miguel del Barco (1973:252-253) noted that natives did not live on the area's beaches. "They traveled there to catch seafood, but only stayed for a day to a day and a half to two days as long as the water in the skin bladders or other containers lasted after which thirst compelled them to retreat inland."

What recent research has shown in the central peninsular Pacific lagoon systems (Ritter 1999, 2002, 2006, 2009; Ritter and Payen 1992) is that population density is a poor measure of the periodic intensity of late prehistoric/protohistoric use of these lagoons by individuals and groups from the nearby mountains. And uses of these lagoons as we shall see in the following narrative were to some extent dissimilar as reflected in the cultural assemblages, likely owing to ethnic/territorial and adaptive variations.

The principal focus of this study is on the archaeological results from the 2002 field season of work along Laguna Manuela and how the archaeological discoveries from this lagoon resemble or do not take after the author's previous lagoonal discoveries at the south end of Laguna Manuela and neighboring Laguna Guerrero Negro and Laguna Ojo de Liebre in work cited above. Furthermore, what behavioral ramifications can be posited from the comparisons?

Local environment

Laguna Manuela, also known as Upper, North or Santo Domingo Lagoon (Henderson 1972:117), is the smallest and northernmost of the central west coast lagoons. This lagoon lies in

the Central or Vizcaíno Desert. This coastal setting and research focus is the western terminus of an expansive plain bordered on the east by the Sierra de San Francisco and on the west by the Pacific Ocean and Bahía Sebastián Vizcaíno. Shreve (1951) and Wiggins (1980) designate this general location as part of the sarcophyllous desert, agave-ambrosia or Vizcaíno region. More locally, there is the marsh vegetation along the present but dynamic shoreline and coastal dunes dominated by occasional thickets of *Encelia ventorum* and *Frankenia palmeri*.

The lagoons historically were rich in sea life (Hubbs 1960; Nelson 1919), and terrestrial and marine vertebrates together in this Vizcaíno desert region in recent observations number 309 (Galina et al. 1991:177). There is also an abundance of other animals in the lagoon sectors, including mollusks, crustaceans, bird life and insects. The greatest limiting factor to habitation here now and during late prehistoric times at least was fresh water, as shallow seasonal pools, fog puddles and possibly *batequis* were likely unreliable sources. Henderson (1972:111) mentions that nineteenth-century travelers journeying to and from Upper California rode a trail along the eastern edge of the three lagoons known as the Camino de Abajo. This trail led out of San Ignacio to the Ojo de Liebre waterhole and "thence to fresh water just inland from Laguna Manuela." He is discussing in this case the Pozo de los Apóstoles (Santo Domingo Well), one that may not have been available in prehistoric times.

Interestingly, Henderson (197229) notes that Laguna Manuela was very shallow, "has little channel area deep enough to hold gray whales. This lagoon was never a significant whaling ground, and long-time residents of the coast do not recall ever having seen more than a few whales in Laguna Manuela."

A detailed geomorphological study of these lagoons has been completed by Phleger (1965:205), who notes that old storm berms occur on the lagoonal barrier thousands of feet inland. He found that the sea level has been at its approximate position for about 2,000 years and that the barrier has prograded westwards some 5,000 ft. in that time. The protected eastern shoreline of Laguna Manuela includes relict and active dunes and fluctuating marine microenvironments. As mentioned, it is shallow and appears to have been infilling with sediment that no doubt affected Native American fisheries.

Field inventory

Site survey generally followed past formats (Ritter 2002) and was not focused on potential buried or covered sites. Teams of 5 to 15 individuals spaced themselves at about a 15-30-m interval along a baseline from a recorded UTM geographic positioning system point. The team then proceeded in a given direction using compasses, recreation-grade GPS devices, topographic maps and landforms for orientation, surveying unexplored areas. This interval did not preclude walking in a zigzag or irregular fashion within the individual's corridor sweep, especially if something of interest was spotted nearby (within 30 m or so).

This writer served in many cases as the coordinator of the survey, keeping surveyors spaced and within the survey block, and as a result traversed the units in a rather random, crisscross fashion. Two-way radios helped in coordination. Concurrently during the inventory, decisions were made on when the surveyors should stop or change direction, mostly depending on whether the area was a very recent landform formation (e.g., active dunes or salt flats) clearly lacking surface cultural remains.

Three variable-sized survey units were inventoried along the ancient eastern shoreline, generally continuing to follow northerly a previously known or encountered strip of prehistoric

activity debris. These survey units were purposively spaced under consideration of logistics and time. The southernmost survey unit was 0.5 km wide and was oriented in its southern part true north-south for 1.5 km on its western side, followed by a dogleg turn to the northwest for another 0.5 km. The outer or eastern and northeastern edge was 1.75 km long on its eastern side and 1.25 km long on the northeastern side, for a total of 3.0 km. Archaeological sites LM-8 through LM-11 were recorded in this survey unit.

The middle survey block, situated west of La Vuelta and La Golondrina (abandoned), was oriented true north-south and was 1.5 km long, with a variable width of 1.0 km on the south tapering to 0.75 km in the north. This variation occurred as the curving eastern shoreline/dune field edge of Laguna Manuela was used to define the western edge of the survey block. Sites LM-12 through LM-14 were documented within this block.

The final survey unit on the north-central shoreline of Laguna Manuela is located west of abandoned Santo Domingo. It is another dogleg survey unit 0.5 km wide with the southerly true north-south portion 1.0 km long on its western boundary before deviating to the northwest for 1.5 km. On its eastern side it is 1.25 km long north south before bearing northwest for another 1.25 km. Sites LM-15 to LM-18 are located in this survey unit.

During the inventory, developed site forms were completed. When a site was encountered, its perimeter was determined and flagging used to mark boundaries and features, cremations and select artifacts such as projectile points and milling tools. A representative sample of artifact types was collected from each site, along with a sample of debitage obtained from linear transects across a site within the view shed of one individual while in a crawling position. Obsidian samples were also collected from each site. Digital, color slide and black-and-white photography were used during the inventory process.

In the actual site recording procedure, a site datum was initially established (durable orange plastic stakes). The site was mapped from this datum using compass and tape measure or pacing as well as GPS positioning if the site was large. The site map included contours, features, and locations of formed artifacts. The site record used includes a wide range of informational choices regarding the cultural and natural characteristics of the site and its environmental situation.

The examination of the survey blocks along the central and northern portions of the eastern shoreline of Laguna Manuela demonstrates a continuation of the strip of remains from prehistoric use of the eastern coast farther to the north beyond previously surveyed areas. This was expected, and the ribbon of cultural residue likely extends around the north end of the lagoon. However, the very northerly portions of the lagoon were not examined. It was apparent that back from the coast at the northeastern side of Laguna Manuela, between the lagoon and the highway along access roads, some remains of cultural activity were present in light scatters of materials such as debitage. However, these were not examined in any detail.

At LM-11, the cultural deposit was excavated through use of a 0.5-x-0.5-m unit laid out in the cardinal directions. A small screen (850-micron mesh) was used in the recovery of cultural materials found to be at least 0.5 m deep. This unit had been arbitrarily placed in what seems like a deep location of deposit with corner stakes and string lines. Arbitrary 10-cm levels were employed. Excavation proceeded carefully with trowel and whiskbroom, line level, bucket and screen. Back dirt was returned to the unit. Excavation followed the ground contour.

The sites

For the lagoons, division of the cultural patches into site loci and sites themselves serves

analytical purposes, especially with regard to studies of human activity variability and management oversight. But this division continued to be perplexing, primarily owing to the active dunes and the nature of the remains themselves, sometimes tapering off to just a few items over an area in excess of 250-500 m^2. Generally, if there was a gap of 50-100 m between patches of cultural debris, then separate site numbers were assigned. This was not always easy, with many small patches of cultural debris.

As in the previous two seasons' work at these lagoons, there are biases at play in the field examinations, including the relative time spent at each locus of cultural material and survey area, the knowledge and abilities of each field worker, shifting sands that can cover remains, minimal excavation work, and possible prior collecting at sites by nonprofessionals. Furthermore, the identification of features was somewhat arbitrary, with a blending of surface remains. For instance, there were certain localized areas of shellfish remains, including single species concentrations from one or more gathering events, stone tool workshop debris blended from various reduction events and clusters of bone and, sometimes, charcoal from possible food processing activities. The overlapping activities have tended to mute individual or group events. And as stated in a previous *informe* (Ritter 2002), the patches of cultural remains themselves are features of a sort. Unless the concentration was unambiguous as to an individual function or specific placement of artifacts or ecofacts, no formal feature was designated. There is certainty again with the further inventory that there is intra-site and inter-site variability of remains within the stricture of marine-oriented residential/activity locations.

The 2002 inventory along Laguna Manuela's shores resulted in the documentation of 11 sites (LM-8 through LM-18) and one new site along Laguna Guerrero Negro (LGN-33). Previous informal work led to the documentation of several sites along Laguna Ojo de Liebre (Hubbs et al. 1962; Moriarty 1968; Ritter and Payen 1992). There are also a number of locations reported to this writer by a local avocationalist and results from historic maritime inventories near the mouth of Laguna Guerrero Negro (Breiner et al. 1999). Thus, regionally there are currently 54 documented sites. Eighteen of these sites are in the vicinity of Laguna Manuela, and 11 of these form the primary focus of this paper. Not included are isolates and occasional very small patches (less than a few meters across) of shellfish remains. Site definitions for the region as a whole have been previously published (Ritter 2006).

These sites are sparse to thick concentrations of shellfish remains, stone artifacts and small rock debris, with occasional bone residue or even shallow bone bed concentrations at one site (LM-18). Most do not appear to be more than 10-15 cm deep, with dune deflation revealing the cultural remains. It cannot be said with any certainty that the dune sites, while often appearing relatively sparse, do not extend to some depth. At least one site (LM-11) with a heavier concentration of surface materials proved to have a true midden with a depth exceeding 50 cm.

There appear to be changes in site configuration and content as one moves from the southeast extremes of Laguna Manuela and continues north. An examination of a number of the major site characteristics in Table 1 shows some of this variability, as does the site description text in Ritter (2009). What are not evident are the diminished concentrations of shellfish at sites during this season's work compared to the thick blankets at some sites along Laguna Guerrero Negro's northeastern shore and the southeastern extremes of Laguna Manuela.

Part of this may be a function of geomorphological differences. For instance, there are fewer pans or intra-dune flats to the north of the area by Laguna Guerrero Negro previously surveyed. There is also a change in lagoon configuration between Laguna Guerrero Negro (currently with lagoon waters in close proximity in low and high tide ranges to LGN sites and

Table 1. Sites (Laguna Manuela, 2002).

	Sitio LM-										
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
No. loci	2	2	2	1	9	2	2	10	6	15	15+
Hallazgos	2		1				1				1
Cremación										+	
Concha principal	*Argopecten*	*Argopecten*	*Argopecten*	*Argopecten*	*Argopecten*	*Chione*	*Argopecten*	*Argopecten*	*Argopecten*	Chione, *Argopecten, Solen?*	*Chione*
Huesos de la fauna	+	+	+	+	+		+	+	+	+	+
Núcleo	+	+	+	+	+	+	+	+	+		+
Lascas	+	+	+	+	+	+	+	+	+	+	+
Punta de proyectil	+	+	+	+	+	+	+	+			+
Bifacial	+	+	+	+	+	+	+	+			+
Perforador		+	+	+				?			
Lascas de buriles						+					
Herramientas lascadas	+	+	+	+	+	+	+	+	+	?	+
Mano	+		+		+		+	+	+		+
Metate			+		+			+		+	+
Mortero						+					
Percutor	+	+	+	+	+	+	+	+	+	+	+
Debastador			+	+	+	+					+
Ornamento de concha			+								
Herramienta de hueso					+						
Tepalcates											
Artefactos históricos											

those at the southeastern extremity of Laguna Manuela) and Laguna Manuela. This northern lagoon has had more sediment infilling than Laguna Guerrero Negro and hence a shallower lagoon that is today subject to extensive tidal variation in lagoon waters, leaving vast expanses exposed during low tide. These differences in tidal ranges have created variations in fishery and sea mammal and reptile presence.

There is a possible difference in the size ranges of sites between the Laguna Guerrero Negro and Laguna Manuela, although this may be a factor to some degree in lumping various patches into a broader site versus splitting off patches into separate sites, in part a product of recent dune coverage. For instance, in the 1999 report this author noted a difference between small sites, less than 5,000 m^2, and large sites over 5,000 m^2 in size. The average for the 12 sites recorded during the 2002 season is 56,193 m^2 with a large standard deviation of 87,570 m^2. (The one Laguna Guerrero Negro site included herein is 2,450 m^2 in size.)

As indicated in Figure 1, three sites were over 100,000 m^2 in size but each is over 80% barren, being a cluster of much smaller patches. Otherwise, the remainder of the sites are less than 31,000 m^2 in size with five less than 9,500 m^2 in size. One significant site with depth is only 275 m^2 in extent. So, if one were to discount the three large sites, the size distribution is comparable to the remainder of the lagoonal sites, with a division between small and moderate size sites. Overall, the most intense use remains close to the northeastern extent of Laguna Guerrero Negro. This is also the location of all of the sites with historic remains.

As seen in Table 1, the Laguna Manuela sites express some variability in the assemblages present, only in part an expression of the size of the site. All sites have artifacts of a flaked stone

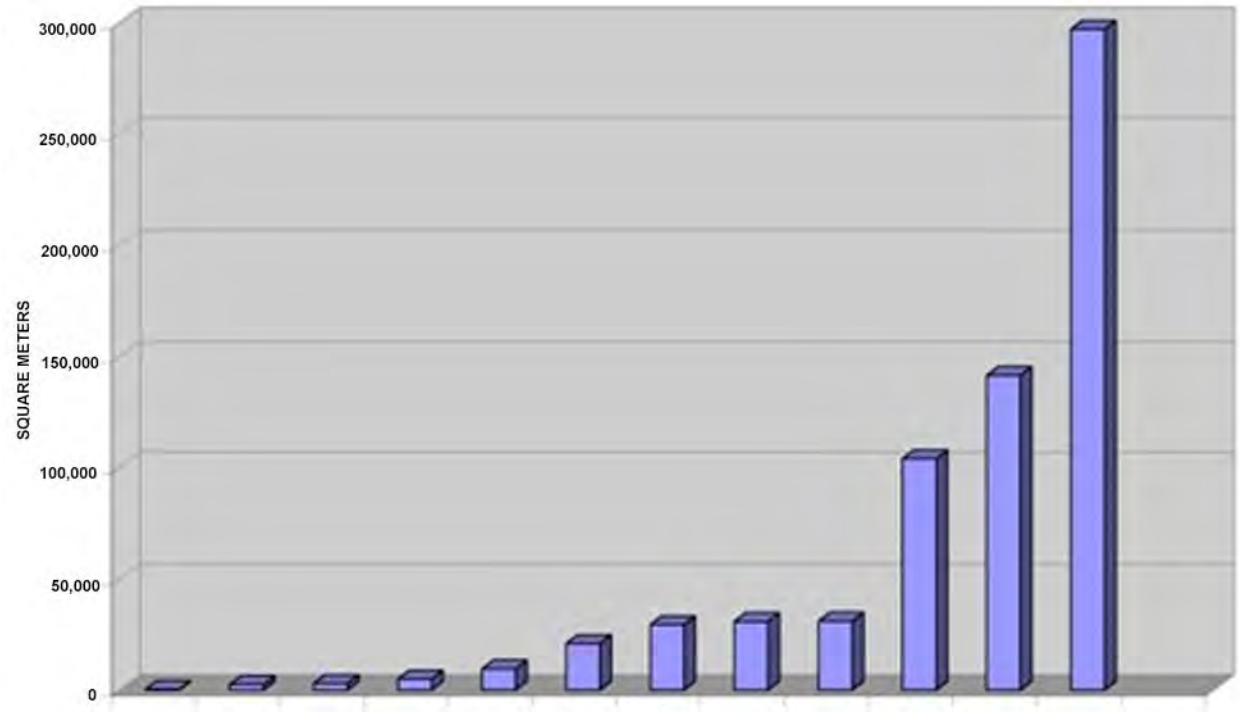

Figure 1. Laguna Manuela / Laguna Guerrero Negro 2002 sitios.

tool industry, including hammer stones and cores. Most have projectile points and bifaces. Many but not all of the sites have milling stones present, from southernmost to northernmost of those recorded. Specialty tools such as perforators and abraders are sporadic in occurrence.

Only one site has human remains, a cremation located at the north end of the inventory. This overall pattern appears infrequent but widespread at lagoon sites. The finding of a single ornament at one site probably relates at least in part to the absence of inhumations and grave goods at most of the sites, although none were found with the one cremation. A further look at Table 1 shows that the more northerly Laguna Manuela sites lack the burin spall industry, with one possible exception. This is likely in part related to the drastic reduction in obsidian use in these sites.

Artifact inventory

Manos

Seven of the 10 LM sites contained manos, including the most northerly site. These all fall within patterns observed at previous regional sites and included sandstone, volcanic and quartz specimens, some obviously from interior sources. Specific specimens are shaped and illustrate edge battering and single and bifacial grinding. Outwardly these manos do not appear different from at least some of those observed at interior sites, although the central pitting noted on many may be a coastal manifestation needing further study. Pitted manos occur at gulf sites as well (cf. Ritter 1995a). These tools are relatively common at the presumed residential/camp site locations and are likely multifunctional and long-standing in peninsular prehistory, an integral part of the milling/pounding/hammering industry.

Metates / palettes and mortar

Portable mortars are uncommon in the lagoon vicinity and rare in reported assemblages throughout the peninsula. Only one was found during the most recent lagoon survey, composed of vesicular basalt. Five of the LM sites contain metates or metate fragments, and as a whole 18 of the eastern shore Laguna Guerrero Negro-Laguna Manuela sites have such devices, including small palette-like grinding tools with no obvious regional variation. Thus these generally portable unshaped tools are relatively common along the eastern shore, mostly composed of sandstone, quartzite or volcanic rock and in one case manufactured from a caliche lens. The ethnographic record (Aschmann 1959:81-84, 87, 91) indicates these tools were used for grinding foods and other materials, and such seems to be the case here, subject to future residue analysis. Milling was obviously important enough in this coastal setting to bring in the grinding assemblage. Certainly certain marine plants and fishbone, as examples, would be well served by these devices.

Abrading stones

Scoria or vesicular basalt abraders were found at four of the 10 LM sites from 2002. These appear infrequently along the lagoons' eastern shore and likely served numerous functions, such as in edge preparation for flaking and for abrading and smoothing bone and wood items.

Large perforated disk

An ovate vesicular basalt slab from site LM-13 has been perforated centrally. This 1.125-kg artifact may have served as an anchor or net weight.

Hammer stones

Cobble hammer stones were found in all of the 2002 Laguna Manuela sites and are common at most sites along the lagoon edge. All specimens are manufactured from cobbles, likely beach cobbles from the north end of Laguna Manuela or elsewhere. Dense rock like quartzite, quartz and felsite was used. Overall, hammer stones or combination artifacts with battering and hammering evident were likely used for many functions such as hammering, battering, pounding and grinding on a variety of materials such as described by McGee (1898:234) for the Seri/Comcáac.

Stone / fossil oddities

Nine unusual stones or fossils were collected during the 2002 expedition to Laguna Manuela. These include apparent small unmodified stones of unusual rock types, including coquina, hematite, galena and sandstone as well as a fossil shellfish and elongated unmodified beach pebbles. These oddities were clearly brought into the sites, primarily, it would seem, as curiosities or to serve an unknown function.

Large flaked knife and scraper-like tools

This is a rather catch-all category of edge-modified, moderate- to large-sized flakes and

flake fragments (ca. 3-9 cm in length) as well as small, flaked cobble forms. It is assumed that these artifacts served in heavy-duty cutting and scraping functions. While their relative frequency in the assemblages is not known, they are common in almost all sites encountered in the lagoons. In the Laguna Manuela area, they are mostly manufactured from non-obsidian rock such as felsite and other crystalline silicate and basalt. Further south, as around Laguna Guerrero Negro, there are more obsidian examples present.

Edge-modified flakes

Smaller than the above category, these flake tools are abundant in the documented sites and include many phaneritic to glassy materials and a variety of worked or utilized edge configurations. A nonrandom sample of 89 such artifacts was recovered from the 2002 sites, bringing to 278 such artifacts from regional sites, a small fraction of those present. The average length of the 2002 sample is 2.4 cm, with an average width of 1.6 cm. A more detailed discussion of these artifacts is included in the 2009 *informe* (Ritter 2009). Likely such tools were used for simple working of skin, wood, bone and other materials. These ubiquitous items seem typical of a tool kit component that might be expected where hunter-gatherer domestic activities were being conducted (cf. Nicholson and Crane 1991:338). Such casual tools were most likely frequently discarded after short periods of use at the camp. Kelly (2001:71) relates that "the longer the logistical foray, the greater the likelihood that a variety of tasks will have to be performed, especially if the group must remain overnight." Certainly at the sites along these lagoons, the edge-modified flakes and other flaked stone tools are quite variable, abundant and expedient, suggesting many logistical forays, manufacture of organic material items and a variety of animal and animal-product processing tasks related to food parts and artifacts.

Perforators/gravers

Perforator or graver-like flaked stone tools number 16 from the 2002 sample sites. The artifacts have bits or beaks well-shaped through pressure flaking, mostly on the edges on various types of flakes but also on a biface and a Laguna Manuela series projectile point. Three of the artifacts have two bits. Most are obsidian. All of these artifacts come from a cluster of four sites along the southeastern shoreline of Laguna Manuela (LM-8 through LM-11). It is perhaps noteworthy that with far fewer bone awl-like tools from the Laguna Manuela sites compared to the Laguna Guerrero Negro sites, there is a presence of these artifacts where drilling, graving and perforating tasks would have been served.

Unifaces and bifaces

Unifaces are not frequent in the overall assemblages, and only two were recovered through various means at two LM sites. One is obsidian, and one is felsite. Together, there are 41 such tools from the two northerly lagoons. They represent both whole tools and broken specimens often utilized after breakage. The scraping function seems most prevalent.

On the other hand, there is an extensive biface tradition at these lagoons, with 236 small to large examples recovered through various means from the two northerly lagoons. These specimens can range from early-stage rejects to well-thinned and shaped specimens. Rejuvenation is also evident. A staged biface technology was used in the occupation sequence for knife-like tools, to

produce burins and to manufacture projectile points of various sizes. Some of these bifaces were undoubtedly multifunctional (cutting, piercing, scraping), an integral part of the tool kit(s) that probably transcended temporal and spatial boundaries, based on similar studies elsewhere in the central peninsula (see Massey 1966 and Ritter 1979 as examples). Most or all sites appear to have biface manufacture and use. However, those northerly Laguna Manuela sites studied seem to have less representation of a biface industry and, not coincident, less use of obsidian. Both local and imported stone were employed. With a predominance of marine foods exploited, the primary use of such artifacts in procurement and processing of fish, sea turtles, sea mammals, birds and the like is highly probable, and the use of such artifacts inland some distance in agave heart acquisition and processing cannot be ruled out.

Projectile points

The Laguna Manuela sites documented were revealing in their diversity of projectile point finds, owing most likely to an absence or low incidence of past collecting. As such, they appear to represent a good picture of point types present from the last several thousand years. Like bifaces, because of their heuristic value these artifact forms were vigilantly sought. The 2002 expedition recovered 54 whole and partial points or untypable point fragments. The types include eight principal categories or forms, with two unique specimens that may be single examples of other unnamed types.

These types have been discussed in previous *informes* for the locality (Ritter 1999, 2002) and in a publication by the author and Julie Burcell (1998). Nomenclature follows these works and studies by Carmean (1994), Hyland (1997), Massey (1966), Ritter (1979; Ritter and Payen 1992) and Smith (1986). The categories include the Comondú and Guerrero Negro series, the Guajademi split-stem, the Manuela contracting stem (named for the location, since they have been formally identified in this locality), Elko-like points, small leaf-shaped points, triangular points and large concave base, corner-notched type, hereafter proposed as the Vizcaíno corner-notched (or Vizcaíno *con esquina-muesqueada*, perhaps Vizcaíno type for short). This latter point may have functioned as a short-handled knife or thrusting spear point.

What the 2002 expedition revealed is that there continues to be diversity in the projectile point (and biface) forms found along the lagoons. And there seems to be a south-to-north variation from previous results. For instance, larger forms are found in more abundance as one proceeds from Laguna Guerrero Negro to Laguna Manuela, perhaps in part owing to prior collection biases. But there is also the very real possibility of older evidence of human use more apparent in the northern lagoon as well as functional (hunting-fishing) variations. Ritter and Burcell (1998:51-55) have offered some interpretations regarding point/biface diversity along these lagoons, and with some updating these include (1) multifunctionalism; (2) temporal variability; (3) subsistence unevenness, including terrestrial and marine game hunting and species variation/abundance between lagoons; (4) scavenging of points from other locations; (5) influx of a number of point forms from a mix of inland groups and (6) differences in raw material availability, breakage differences owing to terrain changeability (e.g. sand versus rocky locations), and re-working distinctions.

Cores and core tools

There continues to be a wide variety of artifacts that can be labeled cores or core tools,

including a variety of materials from obsidian to coarser-grained volcanics. Most of these artifacts are likely derived from nearby beach cobbles, but the obsidian is a long-distance import. There are two general core forms present: small bipolar obsidian nodule cores, and larger non-obsidian cores of a number of techniques. These include unifacial-unidirectional and multidirectional cores, bifacial core artifacts, and unidirectional/rotational core artifacts. Some of the cores resemble the long-standing centripetal core as discussed from nearby Isla Cedos by Des Lauriers (2010:105-110). Bifacial cores resemble discoidals, sometimes humpbacked in appearance.

Steep edges on a sample of the unidirectional, rotational specimens appear from wear to have served as scraping planes. Most specimens in the nonrandom collection appear to have been utilized to derive flakes for lighter-duty cutting and scraping activities, perhaps secondarily in cases to form heavier-duty tools geared toward processing animal carcasses and wood, for instance.

Debitage

Stone flakes are the most abundant artifact found at lagoon sites. One must say, however, that the recognition of shell tools and shell debitage is difficult to gauge in comparison, due in part to a lack of recognition and due also to the plethora of shell debris at these sites. Stone flakes come from tool manufacture, use and rejuvenation. Also occurring are small fragments of non-vitreous or glassy rock from hammer stone activity, milling stone shaping and actions, anvil use, and the like. Debitage includes obsidian, quartz and fine-grained to cryptocrystalline and microcrystalline rock. (Burins and burin spalls are considered below).

There is a clear decline in the presence of obsidian debitage from south to north, with 6% or less of the debitage analyzed systematically being obsidian and in general far fewer flakes and flake fragments of obsidian in the central-northern Laguna Manuela samples. Compare this with the 74% obsidian debitage frequency at one Laguna Ojo de Liebre site (Ritter and Payen 1992). Quartz debitage, on the other hand, generally increases as one proceeds north up the Laguna Manuela coast. Obsidian studies discussed below also demonstrate that bipolar and other flakes are present from sources either unknown or quite distant, in the central peninsula.

The igneous/cryptocrystalline silica and quartz debitage appears to have been derived from hand-sized cobbles for hard-hammer production of flakes and bifaces. Obsidian reduction strategies varied widely around the lagoons, with boulder- to pebble-sized cores and reduction on large to small flakes with hammer stones. Pressure flaking is also evident where the flakes have not blown away. There is a tendency for obsidian raw materials to be smaller in size as one progresses northward up the shore of Laguna Manuela, which also coincides with an overall reduction in obsidian presence. The debitage indicates that a bifacial production and maintenance industry dominates in the sites, although various edge-modified obsidian flakes from core, biface and bipolar techniques are widely distributed. Heavier-duty core tool and larger flake and bifaces are non-obsidian. Biface, bipolar, pressure and radial breakage techniques are infrequently represented in the non-obsidian debitage in the 2002 samples.

The native visitors to these lagoons were quite busy with stone reduction and stone tool maintenance activities. Flaked stone tool production was an important function in the day-to-day chores, with resultant tools serving a wide variety of cutting, scraping, piercing and incising functions. Evidence demonstrates a wide range knapping techniques applied and the obvious familiarity with flaked stone reduction possibilities.

Burin spalls

A burin/burin flake or spall industry, including "core" specimens from which these spalls have been derived, has been identified for the two northern lagoons. Most are obsidian, but some silicified volcanic material has also been used for the production of these specialized artifacts. However, none were found at the four most northerly Laguna Manuela sites recorded, and there are far fewer in the Laguna Manuela sites as a whole (only five from the other Laguna Manuela sites of 2002), undoubtedly owing to a dramatic drop in the presence of obsidian artifacts as a whole. These artifacts are derived from removing the spall or flake transversely from a larger flake or biface edge, or are either tools in their own right or represent the rejuvenation of an obtuse-edged tool through formation by spall removal or to form a new obtuse edge. These items were perhaps used in scraping and incising dense bone, and perhaps hardwoods as well. One use could have been to assist in making bone harpoons and awls.

An interesting parallel in Alaska was discussed by Wenzel and Shelly (2001:119) in discussing the Arctic Small Tool tradition, where they found that high-quality and non-local stone material (vis-à-vis obsidian) was reserved for formal tool production, including burins and burin spalls. Using these spalls as an example, and in consideration of much of the tool kits recovered or observed, it can be proposed that there was a mobile, time-stressed, fresh-water impoverished economy developing a small tool technology on superior imported stone that provided efficient manufacturing strategies in the direct and indirect exploitation and processing of marine foods.

Shell artifacts

Two classes of shell artifacts were recovered or noted during the 2002 season: flaked *Dosinia* sp. valves and resulting debitage, and a 1.22-cm-long mother-of-pearl oval flat shell bead. Also during the expedition, a beautiful circular ornament (about 4 cm across), slightly cupped with 44 cut notches approximately evenly spaced around the inner or cupped edge, was found. This artifact may have been woven into a hair net and is not unlike those late prehistoric abalone ornaments reported by Massey and Osborne (1961:Plate 13) from Bahía de los Ángeles. Álvarez (1975) has noted the widespread tradition of shell ornamentation in the ethnographic and archaeological record for the peninsula.

Faunal remains

Southern Laguna Manuela sample sites LM-8 through LM-12 and LM-14 are dominated by scallop (*Argopecten circularis*) shell remains, with low percentages of other shellfish species including whelk, *Chione* sp., *Laevicardium* sp., *Astraea* sp., limpets and oyster. The ancient shoreline is lined with millions of small *Oliva* sp. shells, a non-utilized animal it appears. Toward the north, LM-13 is dominated by *Chione* sp., and this species and *Argopecten* tend to co-dominate except for one locus at LM-18 where razor clams dominate. While the shellfish remains are not as abundant as found along camps of the east shore Laguna Guerrero Negro, sites contain thousands to tens of thousands of these food animals.

All sites have fish bone, and many have crab remains. Infrequent occurrences of turtle (Chelonidae) and sea mammal bone were noted. Sting ray spines were observed at sites LM-8 and LM-9. Rabbit bone was present at one site, and one site contained the centrum of a whale vertebra. A dog or coyote mandible fragment was recovered at site LM-9. One third phalange modified

raptor claw was observed, as was also found at a Laguna Guerrero Negro site, and bird bone evidence was overall minimal based on the surface observations. While not quantified nor always identified by species, it is not surprising to see subsistence remains dominated by shellfish, fish and crab, with less frequent sea mammal and terrestrial animal evidence. Further discussion of faunal remains can be found in Ritter (2006:147-148), and further studies of dietary remains is an important future task.

Obsidian studies

Thirteen samples of varying obsidian artifacts were collected. Thirteen are from the Valle de Azufre source, the source dominant in the various lagoon assemblages. This included Manuela contracting-stem, Elko-like and Guajademi split-stem forms. One edge-modified flake was made from obsidian that was derived from the cross-peninsula Ángel de la Guarda geochemical source, and one possible Comondú point was made from obsidian that came from the Puerto el Parral geochemical source in the mountains near San Felipe. This specimen is in the most northerly Laguna Manuela site documented. This and previous work continues to demonstrate a connection of lagoon visitors with central and gulf coast locations.

The obsidian hydration results on 17 specimens from the 2002 season from seven sites resulted in 18 readings. Results from the Valle de Azufre specimens ranged from 2.61 to 4.09 microns except for one reworked Elko with three bands ranging from the smallest in the sample at 2.61 microns to a large reading of 5.41 microns. A reworked biface has a double band of 3.58 and 5.41 microns. The Puerto el Parral flake has a reading of 4.01 microns, the Ángel de la Guarda flake has a reading of 3.9 microns, and the unknown source bipolar flake has a reading of 3.44 microns. The Manuela contracting-stem arrow points range in hydration readings on the one source from 2.91 to 3.89 microns, a range that can most likely be considered late prehistoric in this locality. These are within the ranges of the Valle de Azufre readings, but hydration rates on the various sources have not been worked out well. These results are generally consistent with a late prehistoric use of the eastern lagoon for apparently at least hundreds of years. It is also evident that older obsidian artifacts from local or more distant locations were being reworked.

Conclusions

Comprehending the chronological history of human use in the lagoon and interior location studied has relied on the standard techniques of radiocarbon dating, obsidian hydration, projectile point styles, historic artifact types, and, in the interior, rock art styles and imagery. Other artifact stylistic characteristics, such as shell beads and ornaments, are not as yet chronologically established with any precision.

Radiocarbon dating, as discussed in Ritter (2006:142) for the central-west lagoons, has yielded dates in the range of about 500 to 2,000 years ago. This time frame of human occupation has been designated the Guerrero Negro focus of the Comondú period (ca. A.D. 500 to contact) with an earlier, as yet unnamed period preceding this late prehistoric use. Historic-period artifacts attributed to Indian activities provide evidence of lagoon use well into the contact period, to about the early nineteenth century. However, no historic artifacts of Indian affiliation are known as yet from the Laguna Manuela eastern shore.

These readings are well within the middle range of previous results from the Vizcaíno Desert lagoon sites. What is apparent is that neither the smaller (late prehistoric/protohistoric)

readings nor the larger, earlier timeframe hydration readings were obtained during this year's work through the grab sample method (see Ritter 2006:142-143). This relative dating agrees to some extent with projectile points types (at least the later types), and the absence of historic artifacts from this lagoon in samples obtained to date.

Very few late prehistoric/protohistoric Guerrero Negro and Comondú series projectile points were found in the Laguna Manuela sites. More prevalent were Manuela contracting-stem and Guajademí split-stem types (proposed late prehistoric types), and Elko-like and Vizcaíno corner-notched points that (at least in the Elko-like category) appear to predate the late periods (Comondú and contact-era). Projectile point forms along this northern lagoon suggest late prehistoric times and a preceding period, together indicating perhaps several thousand years of use.

Technology

The work in the northern part of the western lagoon system continues to demonstrate the presence of a diverse tool kit with a predominant but not exclusive marine focus. Within the flaked stone tool category, there is a range of both locally made and rejuvenated projectile point types but also what appears to be considerable import of point types of similar and differing forms. Both protection needs and the exploitation of terrestrial and marine mammals and, likely, sea turtles are proposed.

Also included among the stone tools observed at the documented lagoon-edge sites are unifaces and bifaces, relatively large and small bifacial and unifacial edge-flaked and/or utilized edge damaged tools, perforators, cores and core tools, debitage, hammer stones, abraders, and milling tools. Absent from the Laguna Manuela sites observed during 2002 are burin spalls and bone tools such as awls or perforators. The bone awl/perforator absence may be a sampling problem, although stone awls/perforators coincidentally increase in frequency at the 2002 north lagoon sample sites and may in part have been a material substitute for bone awls/perforators.

The biface industry as represented in all lagoon sites can continue to be described as well-developed, with a variety of isomorphic stone types employed. All three defined biface reduction stages from initial reduction forms to well-thinned specimens are present, with some examples showing local rejuvenation and recycling. There is a general continuum in forms from thinner, narrower specimens to thicker, wider ones. A staged biface industry was present in local and imported specimens for knife-like tools, to produce burins spalls in more southerly lagoon sites, and to manufacture projectile points.

The locality-abundant edge-modified flakes and flake fragments of a variety of stone materials and edge configurations seem typical of a tool kit component for hunter-gatherer-forager-fishers undertaking frequent logistical forays. At these times, a range of cutting, incising and scraping tasks would be performed on animal parts and wood products, etc., in activities related both to direct food processing and to tool manufacture and maintenance. Such tools complemented other artifacts in the utensil kit.

Cores and core tools are common in sites, variably ranging from small obsidian bipolar cores to larger discoidal cores. On larger specimens, it is often difficult to judge whether they have been used or not. The small bipolar obsidian examples likely represent a byproduct of the manufacture of small flake tools and wedges for use on materials like bone and wood. Larger cores/core tools probably served many purposes beyond flake manufacture, for secondary use and the performance of heavy-duty chopping and scraping functions on meat, bone and hides.

The abundance of debitage and rock fragments attests to the widespread on-site manufacture and maintenance of stone tools.

Survey was not complete enough in the more inland locales to determine how much of these debitage-producing activities occurred away from the shoreline setting. Clearly, obsidian use declines as one moves north into the Laguna Manuela area, compensated by use of quartz and other siliceous stone such as basalt, quartzite, felsite, rhyolite, silicified tuff and additional local stone with a few apparent exceptions (e.g., some of the cryptocrystalline silica artifacts). The lagoon visitors were noticeably astute at flaked stone tool reduction processes, especially with obsidian. This glassy material, as mentioned above, however, was less prevalent in northern lagoon sites where local siliceous cobbles for the most part were used in core and biface reduction methods, including percussion and pressure techniques. Relatively common hammer stones are present at most sites, but generally cobble tools appear to be multifunctional, including variable use as cores, hammers, and grinding/polishing implements.

Abrading and milling tools are widespread in the lagoon setting. Manos are generally multifunctional and, with milling slabs nearly as common, together they were likely used for a variety of food-processing activities and for other uses such as in breaking up hard materials like stone, bone and shell. Most rock could be obtained locally, but prized specimens may have come from interior settings. Abrading stones may have functioned in such activities as edge preparation in biface manufacture and for abrading and smoothing bone and wood. Of interest is a possible stone anchor implying the use of canoes or balsas.

This is also in accordance with the marine food remnants (shell and bone) prevalent at these coastal sites, although sea turtle and sea mammal remains appear relatively rare compared to shellfish, fish and crab remains. Overall, residential and special activity uses of the lagoons show heavy utilization of a range of tools, with scavenging, reuse, caching, and implement diversity associated with the exploitation of the rich marine environment. Kelly (2001:72) notes that a complex technology may be largely a function of acquiring fish and sea mammals, and not a direct function of sedentism. This seems be the case again with these Manuela sites, despite some technological absences compared to lagoon sites further to the south.

Subsistence / intensification

A summary of subsistence remains has been previously presented and will only be briefly discussed here (see Ritter 2006:147-148). Furthermore, in previous studies (Ritter 1999, 2002) the author spent more time focused on such remains at lagoon sites as discussed in the completed reports. Overall, the tens of millions of shellfish remains indicate heavy exploitation of lagoon gastropods and bivalves, primarily scallop (*Argopecten circularis*) and, as one moves northerly along the east edge of Laguna Manuela, increasing numbers of venus clams (*Chione* sp.). Less important species include *Ostrea* sp., *Solen* or *Tagelus* sp., *Crepidula* sp., *Crucibulum* sp. and *Macron aethiops* with single-species discard loci at individual sites sometimes apparent. Abalone is virtually absent. There is an apparent decline in the intensity of faunal exploitation as one proceeds from the eastern shoreline sites of Laguna Guerrero Negro to the eastern shoreline sites of Laguna Manuela. This may possibly be from fewer folks visiting this vicinity, fewer trips, shorter durations of overall human use, or some combination of factors.

Fish remains are also abundant and were a profound component of the local diet. Beyond a food source, other uses are unknown, although manta ray spines, for instance, could be used as perforators. Considerable work needs to be yet undertaken to better assess the nutritional

component of fish in the diet and to better determine fishing practices and changes in such practices, if any, as the local lagoon filled over time and other environmental and cultural events exacted influences. Further work is also needed to assess fish fauna variations spatially within the three lagoon locations.

While there is no formal faunal analysis undertaken at the newly discovered Laguna Manuela sites, there is evident a clear paucity of use of sea turtles and sea mammals by the residents. Furthermore, few bone remains of terrestrial mammals were observed. One could argue that extensive bone meal manufacturing and animal scavenging has limited the preservation of such remains, and plainly more work in this aspect of the local archaeology is needed. One must be mindful of studies such as Politis (2007:324), according to which certain food taboos and exploitation variations may have an ideational-cosmological basis affecting the zooarchaeological record.

Maritime food acquisition skills were well developed by late prehistoric times if not before, with a variety of littoral settings exploited. The heavy marine food and product orientation contrasts sharply with inland resource exploitation patterns of terrestrial plant and animal foods. Why there was an apparent surge in exploitation of the central Pacific coast in late prehistoric times remains something of a mystery. This author (Ritter 2002:178) has offered some suggestions, including climatic and local coastal changes in terms of geomorphology and hydrology, population increases and intrusions, overexploitation of key highland resources such as agave and various seed resources and technological innovations or introductions such as the bow and arrow. It is also possible that coastal exploitation was gradual, with the end result a more efficient use of coastal resources and water management. Any number of these factors singly or in combination may have resulted in this increased coastal presence during late prehistoric times. The 2002 work does little to clarify this issue.

Residential/activity locations

There is a continuation of closely spaced presumed residential/activity locations or archaeological patches forming a ribbon along the late Holocene shoreline/coastal dune setting on the east side of Laguna Manuela. This shoreline setting is likely a relic of an earlier late Pleistocene-early Holocene dynamic shoreline. However, in comparison to those sites along the eastern shoreline of Laguna Guerrero Negro to the south, these Manuela sites or residence/activity patches are generally smaller, with a lower yield of tool variation and a change in faunal remains (e.g., little evidence of sea turtle and sea mammal exploitation and an increase in *Chione* and razor clam use, with less evidence of *Argopecten* sp. remains). Shellfish density is also lower. In one case (LM-11), there is unmistakable evidence of deposit depth.

While far from certain, it would seem that the bay ecosystems differ between Manuela and Guerrero Negro, with the former shallower (infilling with sediments at a more rapid rate than lagoons to the south) and experiencing dramatic tidal fluctuations. Overall, the Laguna Manuela data indicate very temporary residency by work/family groups, with multiple tasks undertaken related to marine and terrestrial food searches and tool production and maintenance. Shellfish, crabs and fish were the most sought foods, it seems. Overall, it would appear that the Laguna Manuela and Laguna Guerrero Negro shorelines experienced relatively long-term (2,000+ years), overlapping use by visiting family and work groups from areas to the east and northeast.

Mobility

The archaeological evidence is suggestive of the Gulf of California pattern of the Comcáac (Seri) (see Felger and Moser 1985:3), where fresh water limited the coastal visits to small, mobile social groups utilizing temporary camps of a few extended families. Des Lauriers (2010:168) on Isla Cedros off the lagoonal coast sees an establishment of the late prehistoric Huamalgüeño pattern some 2,500 years ago. He discusses interaction with central desert groups, but whether there was any interaction with Laguna Guerrero Negro and Laguna Manuela groups is uncertain since the shortest route to the island would have been from the Vizcaíno Peninsula to the south.

Labor and cooperation

As discussed in a previous article (Ritter 2006:149-150), there was likely both individual and cooperative labor involved in the marine food acquisition processes. There may have been a surplus of sorts (beyond the day-to-day needs) in the food and animal byproducts produced for transportation back to mountain camps. This could have included dried and powdered foods such as fish and mollusks and sea mammal products like skin, bladders, bones for tools and the like. Some nascent prestige developments are possible as in the religious formulators, hunt leaders, balsa/raft/canoe tenders, water stewards, elders, and craft specialists.

There may have been some economic inequalities present among groups that visited the lagoons, especially between those bands or groups from the mountains like the Sierra de San Francisco and those to the north, as from the Sierra San Borja. Presumably favored obsidian use and distribution was more extant for groups visiting the two southern lagoons and relatively rare among Manuela users and those using the coast-to-interior corridors like that near Rosarito-San Francisco de Borja Adac.

Territoriality

Over the course of peninsular prehistory, it is proposed that native groups of hunter-foragers established territoriality, measured at contact by linguistic and cultural variability (cf. Massey 1949). What is not evident yet is how this contact-era variability, its immediate antecedents, and even earlier delineations can be measured archaeologically and how this variability changed over time, likely influenced by environmental variations and cultural influences. One such locality that has been shown to have a measure of cultural and, to a lesser extent, environmental variability is the lagoon systems discussed herein. So what might this variability reflect? An ecological model of Dyson-Hudson and Smith (1978) in hunter-gatherer research was tested positively by Andrews (1994) among Alaskan Yup'ik. These people, who rely heavily on aquatic resources, were found to have territoriality occurring where critical food resources were dense and predictable, very possibly the case in these lagoons as well.

Silberbauer (1994:133), in studies among the G/wi of the central Kalahari of South Africa, found territorial boundaries reached by band agreement in essence providing convenient security in the use of resources. Among Australia's Pitjantjatjara, a similar situation exists, with territory as the space surrounding the group, not a fixed area of land with band responsibility (Silberbauer 1994:126). Silberbauer concludes that a locality among these people is ephemeral and sometimes reflected in mythical geography. As noted by Chapman (1986), hunter-gatherer territory should be considered flexible, and delineation considerable. Peterson (1979:111, 125) even goes so far as to

consider territoriality among hunters-gatherers to perhaps be a fallacy. In any case, there seems to be archaeological evidence that suggests lagoon use was culturally differentiated not so much exactly but more by degree or cline.

Thus, the variability in the archaeological assemblages at the two northerly lagoons may reflect a late prehistoric cultural division that was manifested in inland and west-coast locations, similar to that reported historically. This variation may approximate the historic division of groups around Mission San Borja and the Sierra de San Borja and groups around Santa Gertrudis and San Ignacio in the Sierra de San Juan and Sierra de San Francisco (Aschmann 1959:maps 8 and 9). A food-resource-rich set of lagoons may well have encouraged the roots of this regional differentiation, coupled with sierran or inland variations reflected in the upland geography, hydrology and plant and animal resources, and possibly even in ideologically related space as perhaps exhibited in the rock art (cf. Ritter 1995b).

Non-utilitarian considerations

As the archaeological inventory progressed northward up the Laguna Manuela coast, infrequent findings are present indicating that visitors died when visiting the locality. The late prehistory regional practice of cremation is still evident in the northerly lagoon dune camp complexes. The one individual found does not appear to have any grave goods associated to indicate any special place in the local society. There was only one shell ornament found during the Manuela inventory.

It is apparent that the Manuela visitors shared an interest in rock oddities such as the pieces of hematite and galena found at sites. Whether these were curiosities or formed a more utilitarian use is uncertain for a number of these stone oddities.

Overall, the Laguna Manuela sites in the northern area surveyed continue to express a focus on marine food exploitation by foraging groups with apparent temporary residence and multiple tasks in support of the subsistence pursuits. This maritime center is expressed in the Guerrero Negro focus of the late prehistoric Comondú period and the protohistoric times following. Clearly there was also some use of this prosperous environment by earlier peoples as well.

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