

# The practicality of turning stones into flaked tools among prehistoric peoples of west-central coastal Baja California

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Flaked stone artifacts dominate prehistoric technologies in Baja California. This aspect of cultural knowledge, however dull it might seem to some, forms one of the primary building blocks of regional chronologies and offers a source of information on many other aspects of past human behavior.

Archaeological studies within the central west coast of the peninsula focused on the Ojo de Liebre, Guerrero Negro and Manuela lagoons (Figure 1) have resulted in discoveries of cultural assemblages reflecting protohistoric, late prehistoric and later middle Archaic use (Moriarty 1968; Ritter 1999, 2002; Ritter and Burcell 1998, 1999; Ritter and Payen 1992). These assemblages are particularly revealing in their diverse and, in cases, apparently unique flaked stone categories. Greater details on these assemblages can be found in discussions by Ritter (1999, 2002), Ritter and Burcell (1998) and Ritter and Payen 1992). This article focuses on the locality's flaked stone, a discussion, nevertheless, that cannot be totally detached from an understanding of the associated archaeological evidence also discussed in the above-listed references.

The central west coast lagoons' flaked stone assemblages certainly represent tool manufacture and repair at residential bases along the coast and likely include imported artifacts over and above cores and performs/blanks. Categories discussed in this paper include cores and core tools, debitage, edge-modified flakes and bifaces, burin spalls, flaked perforators and graver-like tools, unifaces, bifaces, and projectile points, among others. Rock type and availability obviously relates to flaked stone tool manufacture and form selection. This is particularly evident between obsidian and non-obsidian technologies. Obsidian was undoubtedly the preferred material for many flaked stone tool types, especially around Laguna Ojo de Liebre and Laguna Guerrero Negro. It is also the material whose origin was most remote, almost exclusively from Valle de Azufre, some 145 km distant.

## **Environmental situation**

Phleger (1965:207) has noted that the central-west lagoonal system was probably derived from a larger basin during much of the Tertiary, eventually capped by a Pleistocene complex of lagoon deposits, wind-born sands and alluvium. These lagoons are part of the greater Vizcaíno Desert, bordered on the west by Bahía Sebastian Vizcaíno and on the east by the Sierra de San Francisco. Wind dominates from the northwest, the vegetation is sparse and the climate is very arid but mild. Older storm berms/lagoonal edges are evident, and radiocarbon dates suggest a relatively stable sea level for the past 2,000 years or so (Phleger 1965:206; Ritter 2002; Ritter and Payen 1992:82).



Figure 1. The central Baja California peninsula.

Vegetation along the coast includes a coastal sand dune community and a coastal salt marsh (Wiggins 1980:24) (Figure 2). While a broad suite of terrestrial fauna was present in the area, ranging from rodents to antelope and deer (cf. Galina et al. 1991; Orr 1960), the locality's principal attraction for Indians was the rich marine fauna (cf. Henderson 1972; Hubbs 1960; Nelson 1919; Scammon 1970), including fish, mollusks, crustaceans, sea mammals and sea turtles.

A major limitation to coastal use would appear to have been fresh water. The only known current spring is at the east end of Laguna Ojo de Liebre. Certainly turtle, seal and animal bladder containers were used, as noted by Aschmann (1959:59), with water possibly relayed from interior sources or stashes. It also would seem that near-coastal water was obtained from brackish water pits or wells, called *batequis* (Aschmann 1959:59). In fact, recent bulldozing at one location along Laguna Guerrero Negro suggests potable water today can be found about 2 m deep. Use of puddled water from fog banks may also have been practiced.

### Observation limitations

A number of factors serve to limit the archaeological observations and conclusions, circumstances mitigated to some extent by surface exposure (excellent), days of observations (weeks), and subsurface excavations. The focus of archaeological work has been coastal, principally along current and earlier post-Pleistocene lagoonal shorelines. There has been collecting of formed artifacts in the past by untrained personnel. Archaeological collection procedures under this author's direction have varied. Surface collection of formed artifacts such as projectile points, bifaces and unifaces and unique specimens such as burin spalls has been



Figure 2. Laguna Manuela.

conducted at all sites. At most sites, a grab sample of other flaked stone artifacts has occurred, along with extensive obsidian artifact sampling. Surface collection transects of flaked stone (and other remains) have been conducted across areas where the artifact concentrations have been the most dense and extensive, or they were done at random from a central point. At some Laguna Guerrero Negro and Laguna Manuela sites, purposefully placed circular excavation units were screened (850 micron mesh), primarily to obtain faunal remains but also to secure other cultural items. At several sites in the Laguna Guerrero Negro vicinity arbitrary or systematic spaced excavation units were sorted, utilizing 3-mm screens. Almost all of the inter-dune sites documented exhibit shallow, sandy deposits, usually only about 10-20 cm deep, with extensive movement of dune sands on and off the cultural remains. Considering the above factors, the overall observation and collection procedures and analyses are believed to provide a reasonably accurate basis for understanding the flaked stone assemblages present along these shores.

### **Cores and core tools**

Water-worn cobbles of fine-grained to macrocrystalline volcanic and quartz rock occur along the outer coast of Laguna Guerrero Negro and Laguna Manuela and at nearby Punta Morro Santo Domingo as well as in the interior within alluvial sediments. Even nearby beds of calcrete were sparingly used for flaked stone material. The cobbles were used for many purposes including raw material for a wide variety of flaked stone artifacts and formed cutting/scraping and edge pounding tools, mainly heavy-duty implements. One very large core of basalt (26 cm long) from an even larger boulder was used to remove flakes up to 15 cm long. The cores include bifacial (including discoidal or centripetal working), multidirectional (those produced by removing flakes from more than two directions and from more than one platform), and less frequent unidirectional-rotational and unidirectional-uniface specimens (Figure 3). The most complex sites in the sample with the largest cores and most core varieties adjoin Laguna Guerrero Negro and the southern reaches of Laguna Manuela.

Obsidian was obviously brought into the lagoonal sites from a great distance, in forms



Figure 3. Cores.

that varied from a large 40-cm-long, 25-kg boulder multidirectional core to pebbles, large flakes and finished or near-finished tools such as bifaces and projectile points (Ritter 1999:93-94). Small bipolar cores of obsidian (see Figure 3, top left and center) are frequent around Laguna Guerrero Negro and the southern reaches of Laguna Manuela. Because of its superior flaking quality and ability to form a very sharp edge, obsidian was generally the more favored material for many of the flaked stone artifacts, especially around the north shore of Laguna Ojo de Liebre and the east shore of Laguna Guerrero Negro. Furthermore, as related in greater detail below, this material was extensively used and frequently reused down to the smallest flake.

### Debitage

Flakes and flake fragments are the most common type of artifact in the lagoonal locality, with upwards to several hundred flakes found while sifting the top 10 cm of a 2-x-2-m unit using 3-mm mesh screen. Most often, there are far fewer flakes per unit area. Recovery of debitage varied in its bias, with 850-micron and 3-mm screens used during excavation, while surface transects were by the visual collection method on hands and knees. High winds in the area may have removed very small flakes in areas of collection to unknown locations away from sites. Obsidian, quartz, fine-grained to macrocrystalline volcanic rock, possibly chert and quartzite are the rock types used in flaked stone manufacture. Historic materials, including green glass and Ming-era Chinese porcelain, were also employed for small flaked artifact production at one site (LGN-1) close to the northeast corner of the Laguna Guerrero Negro. The frequency of the three main rock types (aphanitic volcanic, obsidian and quartz) by site varies by lagoon (see Table 1), with the highest frequency of obsidian at Laguna Ojo de Liebre (74%) and the lowest frequency

Table 1. Limited systematic flake samples from western lagoon sites (south-to-north sampling order).

Site *	Volcanic / Cryptocrystalline Silica	Quartz	Obsidian #
Laguna Ojo de Liebre	134 (25%)	7 (1%)	398 (74%)
LGN-1	123 (76%)	5 (4%)	33 (20%)
LGN-14	102 (77%)	11 (8%)	20 (15%)
LGN-18	62 (75%)	9 (11%)	12 (14%)
LGN-26	104 (63%)	16 (9%)	46 (28%)
LM-1	114 (86%)	1 (1%)	17 (13%)
LM-2	144 (62%)	5 (2%)	83 (36%)
LM-9	312 (91%)	22 (6%)	10 (3%)
LM-13	101 (75%)	34 (25%)	--
LM-14	298 (35%)	565 (65%)	--
LM-15	160 (92%)	3 (2%)	9 (6%)
LM-18 (estimate)	(98%)	(1%)	(1%)

\* LGN = Laguna Guerrero Negro site; LM = Laguna Manuela site.

# All sites had at least a few obsidian flakes.

at sites along central and more northerly portions of Laguna Manuela (<1-6%). Sites along Laguna Guerrero Negro and the southerly reaches of Laguna Manuela ranged in the proportion of obsidian debitage between 13% and 36%. The general “other aphanitic volcanic/cryptocrystalline silica” category has an approximately inverse relationship, with 25% presence at Laguna Ojo de Liebre and a much higher percentage at Laguna Guerrero Negro-Laguna Manuela sites (up to 90% or more). Quartz is present at all sites but seems to be most common at sites within the central reaches of Laguna Manuela (25%+). Overall, this relationship is likely due to the more common presence of cobbles of various volcanic materials and quartz/quartzite near the upper lagoons and the greater access to obsidian through exchange or direct procurement by groups using the central and southern lagoons.

The non-obsidian flaked stone appears to have been derived largely through hard-hammer percussion from beach or stream cobbles in the 5-10-cm range. Finished bifaces or leaf-shaped projectile points of this material attest to later bifacial thinning activities, in cases even pressure flaking. While some of these may have been imported from other areas and few flakes derived from such activities are present, earlier-stage bifaces, possibly rejects, suggest local reduction by these methods. Non-obsidian flaked stone artifacts were commonly produced by hard-hammer production into heavier tools, although bifaces especially and projectile points and small edge flaked tools are also present from such materials.

Obsidian reduction strategies, on the other hand, were extremely varied within the locality, more so in the southern two lagoons. All obsidian flakes are less than 4 cm long, with the vast majority less than 2 cm long. However, on the large core from LGN-1 there are obsidian scars up to 25 cm long, and at the Laguna Ojo de Liebre site (Ritter and Payen 1992:257) an errillure flake 2.6 cm long hints at the production of large percussion flakes.

As stated above, obsidian materials are being imported into the locality in variable form and size. Hammer stone reduction is apparent, with some platform preparation (grinding/abrading), especially during biface manufacture. Collapsed platforms are also common on the obsidian debitage. A bifacial production and maintenance industry dominates obsidian use, although various edge-modified obsidian flakes from core, biface, unifacial-bifacial, bipolar, radial, and burin techniques are broadly distributed and common, especially core/early biface reduction flake use.

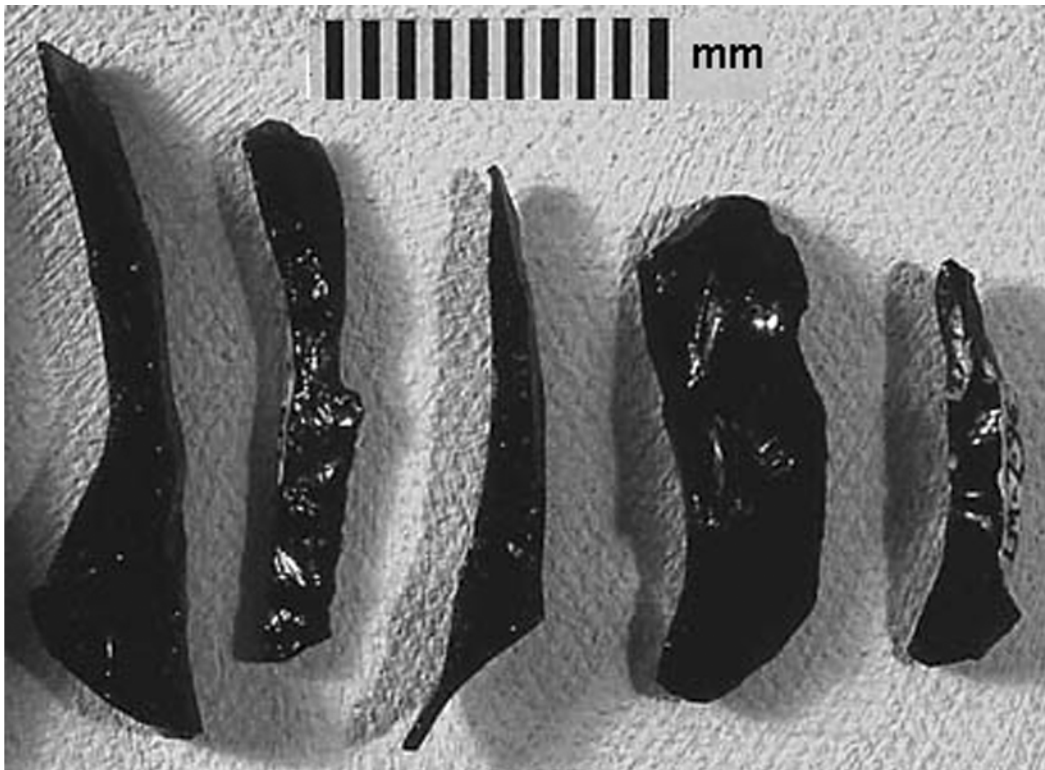


Figure 4. Burin spalls.

The most remarkable aspect of the flaked stone tool industry at these western lagoons is the range of techniques applied and the obvious familiarity with flaked stone reduction possibilities, an assortment of methods not identified in such a broad scope in the peninsula (cf. Hyland 1997; Moore 1999; Ritter 1979, 1994, 1995, 1997; Rogers 1939).

### **Burin spalls**

One unique aspect of the flaked stone tool industry in the central western lagoon locality is the production of burin spalls and burinated edges, primarily (>90%) of obsidian but also including cryptocrystalline materials (Figure 4). Such an industry has not been reported from other regions of Baja California. Following Sackett (1989:52-53), the burin technique is defined as the removal of a longitudinal flake or blade transversely or obliquely from the edge of a tool, flake or core to form a useable, generally obtuse edge, to rejuvenate a dulled utilized, generally obtuse edge, or to form a burinated facet at the platform where the flake was struck or at the point of termination. So far missing from this locality are the platforms showing the burinated facets. It is apparent that the burinated edge was used on at least some of the artifacts that have burin spall removals. There is at least one case of burin removal off the end of a burin spall.

Burinated tools and burin spalls occur occasionally in the tool kits, with less than 75 examples found, all at sites along the Laguna Guerrero Negro and southern Laguna Manuela shoreline. It is probable that they occur also along Laguna Ojo de Liebre, but this has not been confirmed.

The lengths of the spalls vary between just over 1 to about 6 cm, with an average around 3 cm. Widths range from 0.12 to 1.4 cm, averaging about 0.6 cm. Thicknesses range from 0.21 to



0.89 cm, with an average of 0.5 cm. Worked edges have a mean angle of 66° but with a range between 25° and 110°. Workers preferred the more obtuse edges and perhaps the sharp facets on the ends for use.

The sample includes burin spalls indicative of the removal of a worn edge. Some of these items were produced on a thick flake or biface to produce two edges, used, dulled, and resharpened by burination. Most burin spalls, however, appear to have been manufactured with four obtuse edges, and then used, with some resharpening of the thicker ones. Many burin spalls exhibit use wear in the form of edge crushing and nibbling, wear that experiments by this author suggest can result from scraping dense bone. Burin spalls were derived from the edges of various stages of bifaces, from unifaces, from flakes and from a bipolar core. In the later case, it is evident that some burin blows were supported by a stone anvil.

No other burin spall industry has been reported from Baja California. However, independent industries are known in other areas of North America, such as in Paleo-Indian and early Archaic collections (Epstein 1963; Tuohy 1969), the Arctic Small Tool Tradition/Cape Denhigh complex (Dumond 1984; Irving 1955; Wenzel and Shelley 2001) and, apparently, in traditions along the Alta California coast (Chartkoff and Chartkoff 1984:195; Heizer and Kelly 1962; Schwaderer 1992:63).

There is little doubt that there is a well-developed, late prehistoric, likely independent burin/burin spall industry in the west-central peninsula lagoon locality. The association with a coastal setting is like other such industries found in coastal western North America. Wear patterns are consistent with those produced with use in working dense bone, shell and possibly hardwood, such as in manufacturing bone harpoon tips, awls and shell ornaments. As discussed by Wenzel and Shelley (2001:121-122), burin spalls and other flaked stone techniques on high-quality materials discussed in this article are decidedly suggestive of a mobile economy where raw materials are scarce.

### **Edge-modified flakes**

The most common tool at lagoon sites is the edge-modified flake or flake fragment. Such artifacts are characterized by regularized or consistent modification along a select portion of the flake's edge in a position that would facilitate hand-held use or hafting. Sharper tools predominate (averaging around 32°) but with more obtuse angled tools present. These flakes average about 3 cm in length and half that in width, with an average thickness of 0.35 cm for the 1999 expedition sample. There are thousands of these artifacts in the locality. Any stone capable of conchoidal fracture was used, with the obsidian examples tending to be smaller in size and much more common than other stone types.

The majority of edge-modified flakes are unifacial, with sizeable numbers of bifacial and unifacial/bifacial examples (see Ritter and Payen 1992:Figure 15.5). The form of edge modification is quite variable, including crushing, nibbling and regularized flaking in various combinations, much of it from use. Almost always, the used edge is straight when viewed from the side and in plan view. However, there are edges that in plan are quite variable, including spoke shave and serrated examples (Ritter 1999:101). The flakes themselves are representative of various methods as described in the debitage section, with the exception of later-stage biface thinning and pressure flakes. Core reduction and early biface reduction flakes predominate.

These ubiquitous tools have characteristics representative of a variety of uses in cutting and scraping various soft and harder materials. These tools were expedient, in cases representing

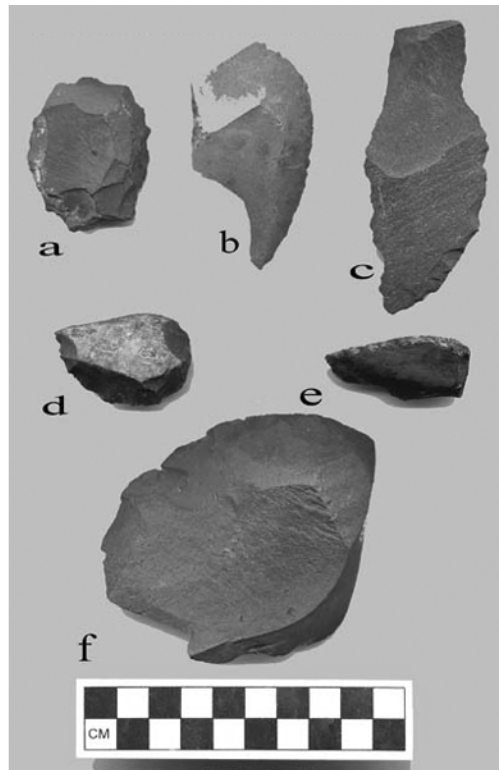


Figure 5. Large flaked knife- and scraper-like tools.

recycling of larger tools and flakes after breakage. They are part of a diverse flaked stone tool kit that served multiple cutting and scraping uses in light to medium duty activities involving various animals and animal parts and plant products. They were byproducts of logistical forays where a variety of tasks were performed.

### **Large flaked knife and scraper-like tools**

There is a probable gap in the overall size between edge-modified flakes and these larger tools. Otherwise, they share numerous characteristics. Those examined represent a grab sample of scores of such tools found throughout the locality at virtually every site (Figure 5). There is a tendency for non-obsidian materials to predominate, including basalt and other aphanitic volcanic materials, including “baked” tuff. Parenthetically, there is a high likelihood that various flakes, both small and large, with no obvious edge modification served as tools. For instance, at one site near the mouth of Laguna Guerrero Negro, several large unmodified flakes were found, probable tools if not tool “blanks” (Figure 5f).

The tools of this category generally range between 4 and 10 cm in length, 1.5 to 8.0 cm in width and 0.5 to 2.0 cm in thickness. The presumed utilized edges average about 30°. The generally thin working edges may have been utilized in the more vigorous cutting activities involving sea mammals, turtles and fish. Various modified edge configurations are present, including straight, convex, concave, serrated, irregular and multiple. Most artifacts are from early to late core reduction flakes or remnants of flaked pebbles or cobbles.





Figure 6. Perforators/gravers.

### **Flaked discoidals and cleaver-like tools**

This division of flaked stone represents rather distinct items found in the locality. These are known principally from the Laguna Guerrero Negro sites.

Flaked discoids are larger, fine-grained to aphanitic volcanic flakes (3.0-7.0 cm across) that are formed into a discoid shape by unifacial (most common), bifacial or combined unifacial/bifacial flaking (Figure 3, lower left; Figure 5a). Considerable reduction and probable resharpening are evident on many of these artifacts. Thicknesses vary from 1.4 and 2.2 cm, with edge angles averaging 51°. Two specimens resemble “thumbnail scrapers”. The other tools likely provided moderate-duty cutting and scraping tasks.

The uncommon cleaver-like implements are made on large percussion flakes, a broken metate, and platy slabs of basalt (see Ritter 1999:183-185). The mostly straight margins exhibit retouch. Edge smoothing and abrading are probably from use, perhaps from heavier-duty scraping and cutting functions, cleaver-like as used in cutting up animals. Similar tools occur around Bahía de los Ángeles (Ritter 1995).

### **Flaked stone perforators, gravers and splitting devices**

What appear to be perforators, gravers and small splitting tools are rare in the assemblage but broadly distributed along the shoreline of the two northern lagoons in the first two cases. Siliceous material as well as obsidian is represented.

Both medium flakes, a broken biface, and a small projectile point reworked at the distal end have been used to create sharply tapering, sometimes needle-like projections or bits that could easily serve as perforators or gravers (Figure 6). All of these perforators/gravers are less than 4 cm in total length, with the bits considerably shorter, less than 2.0 cm long. Both diamond

and lenticular cross-sectioned bits are present. Certainly the sharp bits could have functioned like awl ends, but could also have been used in graving-like activities. The larger bit, broken during use, would have served heavy-duty drilling and perforating activities. These tools could have been hand-held or hafted.

A unique obsidian tool may have functioned as a small wedge or splitter (see Ritter 2002:66 [d]). The worked bipolar flake (1.58 x 1.54 x 0.5 cm) from site LGN-3 has a crushed, wide distal end with tapering flaked sides and distal end. (Part of a biface from another site with similar characteristics may have served a similar function). The flaked distal end exhibits small, stacked flakes and some crushing, possibly from use. Such tools could have served in splitting bone and wood when hit with a small hammer stone.

## **Unifaces**

Over 40 unifaces have been recovered from Laguna Guerrero Negro and Laguna Manuela sites in a nonrandom sample (see Ritter 2002:118-121). However, they are clearly relatively common and widespread in the locality. Such tools are characterized by flakes that have nearly continuous, generally unifacial edge modification around their usually leaf-shaped perimeter. Almost all unifaces are straight in profile. Most are made from obsidian.

Unifaces are generally between 1.4 and 7.8 cm in length, with the majority in the 3-4-cm length range. Widths range between 1.2 and 4.1 cm, with an average around 2.0 cm. These tools are usually relatively thin, averaging around 0.6 cm. Edge angles are quite variable, even on a single specimen, with a range on the sample from 20° to 80°, averaging 51°.

The edges on these artifacts are invariably finely crushed on top of steep marginal flaking, even on broken edges. Striations and edge polish on some examples may be from use, and some of these tools could have been hafted, while others were hand-held during use. A few exhibit burination along an edge. Most of these tools were apparently discarded due to breakage or excessive wear, and some were probably used as scrapers. A few of these implements have bipolar flaking suggesting use in bone breakage and marking. These probable multifunctional tools were made on large, late core reduction and early-stage biface percussion flake removals.

## **Bifaces**

Detailed information regarding bifaces in the three-lagoon region has been presented elsewhere (Ritter 2002; Ritter and Burcell 1999; Ritter and Payen 1992). Bifaces are defined as elongate artifacts, often leaf-shaped with flaking on both faces (Figure 7). They range from unfinished failures to variously refined specimens. Broken bifaces were often used as tools as well. The analyzed sample includes well over 150 specimens from throughout the locality in all stages of manufacture.

For analytical purposes, the bifaces were divided into three general stages of reduction, early, middle and late, based on amount of flaking and thinning. These stages are thought in part to have some relevance to functions as cruder, heavier-duty knife-like objects, more refined knives, projectile points and more delicate knife-like forms.

Statistical tests (see Ritter 2002) indicate no sharp breaks in length by stage. The longer initial-stage bifaces were reduced in more advanced stages to shorter lengths, but overall the more refined products can be variable in length. The larger bifaces are not obsidian, owing to limited raw material availability, reuse and the durability of non-obsidian materials such as



Figure 7. Bifaces,

quartz. However, a vast majority of broken early-stage bifaces are obsidian, the remainder being aphanitic volcanic, cryptocrystalline silica and quartz.

Biface lengths in all stages range from 2.1 cm to 16.8 cm, with an average around 5.0 cm. Widths vary from about 1 cm to over 10 cm, with an average around 3-4 cm. Thicknesses run from 0.14 cm to 4.2 cm, with an average around 0.7 cm, with considerable deviation.

Early-stage bifaces are thick in cross-section, sometimes with a limited planar symmetry and irregular margins derived from large percussion flake removal. These artifacts were made from large percussion flakes and from smaller flakes derived from bipolar reduction.

Middle-stage bifaces are well-shaped, symmetrical preforms or finished tools that exhibit extensive percussion flaking and thinning. Flake scars generally extend across the midline of the artifact. Over half of these specimens are obsidian, the remainder being various fine-grained to aphanitic volcanic rock and quartz. Over half of the specimens exhibit perverse breakage, likely from manufacture mishaps. A small number exhibit bipolar reduction, and others show hinge breakage, possibly from use. At least one exhibits burin removal along both edges. Some of these specimens are clearly knife-like tools and/or projectile points.

Late-stage bifaces exhibit further reduction, with essentially symmetrical shape and often signs of limited to extensive pressure flaking. Triangular projectile points and those with haft elements present are excluded from this category. Likely some of the late-stage leaf-shaped bifaces functioned as projectile points. Both perverse and hinge fracturing are present on broken specimens, and there is also evidence of fluting and bipolar and radial breakage. Over two-thirds of these specimens are not obsidian but are made from other rock types.

There was clearly a rich biface tradition along the lagoon shores, with an apparent wide range of biface-related tool/implement production and rejuvenation. Artifacts in all three stages

of production were variously used, and there are apparent rejects or discards in all three stages as well. Bifaces were locally made from cores, large flakes, and preforms, some of which may have been imported. Some bifaces may have been brought in as finished tools, later locally resharpened or reshaped.

A staged biface technology was used in the manufacture of knife-like tools, to produce burin spalls and useful burinated edges and to manufacture projectile points of various sizes. Some bifaces were likely multifunctional (cutting, scraping, piercing), an integral part of the tool kit, a part that appears to transcend spatial and temporal boundaries in the central peninsula (cf. Massey 1966; Ritter 1979).

## **Projectile points**

The final category for dialogue is projectile points, a topic previously discussed at some length in print by Ritter and Payen (1992) and Ritter and Burcell (1999) with empirical data references therein. Only a brief summary is offered here, with insights from the 2002 expedition to the locality. Definitions of projectile point types follow a number of paths, including use of previous typologies for the peninsula and adjoining areas, critical application of a key to projectile point variability in the central Great Basin by Thomas (1981) and qualified recognition of variable characteristics such as haft element juncture, size, outline, and other form characteristics. The typology is thus a blending of types that appear confined to Baja California and types that have permeated the peninsula from Alta California, the Great Basin and the Southwest. It is as yet provisional.

By far the most exquisite projectile points of the locality are those of the local coastal Guerrero Negro series, almost always obsidian (Figure 8). These triangular points, as first identified in Ritter and Payen (1992), have width to thickness ratios of 1:7 to 1:12 exhibiting fine craftsmanship. These points have slightly concave to triangular bases and may be finely serrated. There appear to be two divisions of these points: those less than 5.0 g and 4.5 cm in length and those 7.5 g or larger and 5.0 cm or longer in length. These are the most common projectile points at the one site examined on the north side of Laguna Ojo de Liebre and at sites along Laguna Guerrero Negro, including near its mouth, but less so as one moves north along Laguna Manuela. Over 75 have been recovered. They also appear to have been manufactured locally, based on debitage and biface evidence and an apparent manufacturing break on one. Broken green bottle glass and Chinese porcelain tips of small points may be from this type or one of the small arrow point types described below. This form is known from Estero de Coyote near Punta Abreojos supported by an examination of a private collection and from Isla Cedros based on 2002-2003 research by Matthew Des Lauriers of the University of California, Riverside. These points are thought to be harpoon end insets, a complement to the small arrow points found in apparent association.

A well-known late prehistoric projectile point series that occurs throughout the central peninsula is the Comondú series, including triangular and serrated/side-notched varieties (Figure 9). Only the latter variety, made from obsidian and, in individual cases, quartz crystal and worked green glass, occurs occasionally in the study locality. It is not found in the frequency reported by Hyland (1997:298-299) in the central peninsula highlands. This appears to be one of the late prehistoric/protohistoric complementary types with the Guerrero Negro series. No points of this type were found in the Laguna Manuela sites inventoried.

A relatively uncommon probable arrow point (<10 known) found in at least the Laguna



Figure 8. Guerrero Negro series and Manuela series projectile points.



Figure 9. Comondú, Guajademi and Manuela contracting-stem projectile points.

Manuela Lagoon area is the Guajademí split-stemmed type, most often made of a siliceous volcanic material. This form also occurs infrequently throughout the central peninsula in apparent late prehistoric contexts.

Another small apparent arrow point type found occasionally around the lagoons is a previously unnamed narrow, contracting-stemmed triangular blade type, proposed in this paper as the Manuela contracting-stemmed type. Less than 20 have been recovered to date in the locality. Barbs are not well developed on this type, which was found manufactured from obsidian, basalt and siliceous volcanic materials. A majority of these points occurred in the Laguna Manuela sites, especially site LM-9, and at least one was recovered during 2002 work by the author near Rosarito. Still, in this lagoonal location, they were found in higher frequency than the Guerrero Negro type. The occurrence of these points in the Manuela sites and the apparent absence of the Comondú points may be suggestive of different late prehistoric groups using different lagoons. The variability of small, presumed arrow point types suggests these are social identifiers for various bands or larger groups, if not representatives of different time periods.

Among the most common larger projectile points in the Laguna Guerrero Negro and Laguna Manuela assemblages is the Elko-like series, a point form that is widespread in the peninsula in a number of varieties. While a few have been found at Laguna Guerrero Negro sites, more (less than 25) are known from Laguna Manuela sites. The difficulty in this assessment is the probable skewing of data due to past collecting activities by non-archaeologists, especially of those larger, more obvious forms at sites closest to the urban center of Guerrero Negro.

As discussed in Ritter and Burcell (1998:40, 43), these probable atlatl points persisted for thousands of years in use, possibly overlapping with the use of the bow and arrow well into the first millennium A.D. Most are not obsidian, including quartz and siliceous volcanic materials, possibly brought into the area from elsewhere as completed artifacts.

A class of as-yet-unnamed projectile points found with some regularity along Laguna Manuela and from scattered locations elsewhere in the Laguna Guerrero Negro-Laguna Manuela vicinity are large points with triangular to slightly excurvate blades and short, medium-width to broad excurvate bases defined by corner-notching (Figure 10). The general basal widths with hafting notches imply a large shaft, about 1.5-2.0 cm in diameter. Several of these points were found with a small basal notch, and almost all are non-obsidian. Massey (1966) and Ritter (1979) reported similar examples in infrequent numbers from the central peninsula. A relationship to the Elko-like series, corner-notched variety cannot be dismissed (cf. Hyland 1997:Figures 5, 6), but the overall consistency in length (later reworking aside) and a pronounced excurvate base (sometimes relatively narrow) make these stand out in the corner-notched haft element juncture sample (both in numbers and local occurrence) in comparison with the other Elko-like subtypes (eared and straight base, for instance).

There is the possibility that these points are hafted knives and or spear points, abundant locally due to the procurement and processing of sea mammals. They seem to co-occur with small arrow points, suggesting that at least some are late prehistoric in age. Unfortunately, these are almost always non-obsidian, negating obsidian hydration testing.

There are a number of other uncommon projectile point types in the Laguna Guerrero Negro and Laguna Manuela sites. These include a few mostly obsidian, deeply serrated eccentric types as reported from the central peninsula highlands by Hyland (1997:301), Meighan (1978:Fig. 2) and Smith (1986), who also discusses similar points from Punta Eugenia. They are as well known through personal observations from Estero de Coyote near Punta Abreojos. Other types included are small leaf-shaped and triangular points, a possible La Paz/Gypsum Cave-like





Figure 10. Corner-notched projectile points.

point, and a basalt possible wide-stemmed point base from a private collection.

What appear lacking from the area are unqualified Paleo-Indian points, Pinto-like points, La Paz/Gypsum Cave-like points in any numbers, Loreto blades, Zacatecas broad-base points (cf. Ritter 1979:198), and the small Comodú triangular points so common in the interior highlands (Hyland 1997:298). The obvious implication is that there was less contact with traditions to the south/southeast and little evidence of early to mid-Holocene uses along a dynamic coast. There is a diversity of forms present with some apparent spatial variability.

## Conclusions

The advantage of investigating the lagoonal archaeological sites is their extreme visibility and the assurance that at the dune sites at least all stone was brought in by past peoples. Such importation seems not to have limited the flaked stone technologies present, either in terms of the reduction of raw materials or the manufacture, refinement and repair of flaked stone items. Overall, more favored stone such as obsidian was extensively employed and reemployed, and in at least one instance a 25-30-kg obsidian core was carried some 150 km from the Valle de Azufre source to Laguna Guerrero Negro and cached for use.

There are flaked stone technologies evident in the locality that appear restricted to the west central peninsula coast and Isla Cedros, especially the Guerrero Negro series projectile points. Only around Laguna Guerrero Negro and the southerly reaches of Laguna Manuela has there been found a burin detachment industry. Furthermore, there is a diverse obsidian reduction process including unifacial, bifacial, bipolar, core reduction in many forms, radial breakage, pressure and burin spall removal. Reuse and scavenging of stone for flaked stone artifacts,

especially obsidian, is evident.

The expediency of much of the flaked stone tool kit, especially non-obsidian stone, implies relatively high mobility, rapid manufacture, short-term use and discard. In a discussion of tendencies toward sedentism among hunters and foragers, Kelly (2001:73) suggests: "The longer an encampment is occupied, the greater the likelihood that tools will be used extensively, rejuvenated, and scavenged, and that cores will be reduced bipolarly." However, of interest to lagoon use, Kelly (2001:72) does note that a complex technology may be largely a function of acquiring fish and sea mammals, and not a direct function of sedentism.

The wide range of flaked stone tools does imply some level of residency where many tasks were performed. This can be coupled with the multitude of other tool types, a variety of materials, especially at larger, denser concentrations of cultural materials, most notable along the eastern shore of Laguna Guerrero Negro and southeastern Laguna Manuela. Multiple tasks were at hand and multiple uses of some tools are likely. There is a heavy utilization of tools and reuse, caching, scavenging and implement diversity associated with a rich, varied set of marine and terrestrial resources with recurring, if not short-term, episodic visits by family groups. There is a suggestion based on the tool kits, material types and artifact types, especially projectile points and obsidian use, of diverse groups using the different lagoons at least during late prehistoric times, a defined Guerrero Negro focus of the Comondú period transitioning into the historic period.

The technologies expressed at the various coastal sites, including flaked stone, are characteristic of a very mobile people and possibly long-range interactions, at least as far as the central cordillera with clear differential access to obsidian. Projectile point types and dating methods ( $^{14}\text{C}$  and obsidian hydration) suggest periodic earlier use of the lagoons, at least back two millennia.

There was a distinct coastal focus on marine exploitation of fish, sea mammals, crustaceans, shellfish and other resources that was part of an interaction sphere or network of central cordillera-to-coast mobility. This pronounced focus resulted from external and internal cultural influences and factors as yet poorly defined but possibly including environmental changes, population growth, technological transformations and introductions, groups pushing in from outside, overexploitation of mountain resources, and so forth. But one has to consider that the more optimal use of these coastal stretches involved marine knowledge and at least a basic technology (flaked stone and other) and know-how that did not spring up overnight, but one that was rather rapidly applied and augmented at these bountiful lagoons.

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