liter of soil), the density of these microartifacts generally exceeds the figures reported by Widmer (1991) for a suggested lapidary and shell-working area at Teotihuacan (Feinman et al. 1993). The recovery of these microartifacts in the heavy fraction from floor deposits provides additional support for the argument that these materials were worked inside the excavated house (Feinman et al. 1993; Middleton 1998, 213–14). Although larger artifacts of most of these materials were not particularly abundant in the collections associated specifically with the structure, all were present in the dense midden. For comparison, similar samples taken from a deposit associated with ceramic firing contained many small fired concretions and a greater quantity of small bone fragments than found within the house, but only a single obsidian flake and no shell (Feinman et al. 1993, 38–39).

Chemical analysis (ICP) of soil samples taken systematically from the house floor also supports shell working in the house (Middleton 1998, 238–40; 2004; Middleton and Price 1996). Marine shell is composed of calcium carbonate, which is subject to chemical degradation and dissolution in the soil. Some techniques used in shell working produce very fine debris that cannot be recovered by standard microdebitage techniques, so chemical residues help pinpoint shell working. Bone also degrades into the soil, contributing both calcium and phosphorus, but the Ca:P ratio can help separate calcium added by shell and calcium added by bone. The ratio is highest where Ca is high relative to P (more shell) and lowest where P is highest relative to Ca (more bone). At Ejutla, high concentrations of Ca and P in the midden are attributable to the presences of both shell and bone in those deposits. The highest Ca:P ratios were within the house, with the distribution matching the general pattern of marine shell microdebitage (Middleton 1998, 240). These two independent analyses provide additional evidence that the residents of the excavated structure engaged in crafting shell ornaments.

8.6. Monte Albán Shell and Comparisons with Ejutla

Between 1992 and 1997 we analyzed thousands of pieces of shell from excavations at Monte Albán directed by Marcus Winter and by Ernesto González Licón (Feinman and Nicholas 1995a, 1995b; Appendix 7). Most of the shell (n = 3351) is from contexts that were excavated during the Proyecto Especial Monte Albán 1992–94 (Winter 1994). These contexts are concentrated on the Main Plaza and the North Platform and include one area where there is good evidence of shell working (see also Martínez López and Markens 2004). A small amount (n = 82) is from burials and tombs that were excavated on several terraces in a residential area approximately 1 km northwest of the Main Plaza during the Proyecto Monte Albán 1972–73 (Winter et al. 1995). The rest of the analyzed pieces (n = 386) are from one context on the North Platform and from houses and mortuary contexts that were exposed during the Proyecto Salvamento Carretera de Acceso a Monte Albán 1991, directed by González Licón (2003).

There are many similarities between the shell assemblages at Monte Albán and Ejutla. The same broad categories of worked and unworked shell that we documented at Ejutla are present at Monte Albán (Table 8.6). At both sites, most of the shell is from the Pacific Ocean; a few *Marginella apicina* shells at both sites and one *Cypraea cinerea* at Ejutla are from the Atlantic**,** Table 8.7). This preponderance is not unexpected given that the shortest routes (by foot) from the Pacific Coast into the center of the valley and Monte Albán pass through Ejutla (White and Barber 2012). The most abundant taxon is *Pinctada mazatlanica*, accounting for 55–60% of all shell in the analyzed collections (Table 8.8, Figure 8.30), and nacreous mother of pearl also accounts for ~50–60% of all ornaments at both sites and 40–45% of the finished ornaments. But there are differences in which nacreous ornaments were finished. Placas, the most common ornament at Ejutla, are also prevalent at Monte Albán (Figure 8.31), but nacreous beads and pendants are considerably more abundant at Monte Albán (Figure 8.32) than at Ejutla (Table 8.9, see Table 8.4 for Ejutla), and unperforated shell disks like those at Ejutla are present in much lower quantities at Monte Albán. We suspect that at least some of these unfinished disks are blanks for disk beads, and once perforated, they would look like the perforated nacreous disk beads at Ejutla (some of which are also present at Monte Albán). Other common bivalves are *Spondylus* sp. and *Chama* sp., both of which were used for ornamentation in prehispanic Mesoamerica, prized for their colorful shells (Moholy-Nagy 1994a; Velázquez Castro and Melgar Tísoc 2021). There are low numbers of beads, pendants, and placas of both genera at both sites (Figure 8.33). Most other bivalves are present in very low numbers and often with no evidence of working.

The pattern for gastropods is different (see Table 8.8). Although many of the same taxa are present, large gastropods, including *Strombus* sp. and *Patella mexicana*, are much more abundant at Ejutla (30% of the assemblage) than at Monte Albán (5.5%). At both sites, bracelets are the most common ornament made from *Patella*, while beads were often made from large gastropods. It was not possible to positively identify the taxa of many finished matte white beads, but even given the possibility that they were made from large gastropods, the proportions rise to 40% at Ejutla and only to 13% at Monte Albán. In contrast, whereas many different small gastropods are found at bth sites, they are much more common at Monte Albán (491 vs. 178 at Ejutla), especially as perforated whole shell beads and pendants (258 at Monte Albán vs. 21 at Ejutla). Among the most common at Monte Albán are olive shells (*Oliva* sp., *Olivella* sp., *Agaronia* sp.) and turret shells (*Turritella* sp.), which often were perforated for stringing as beads and pendants. Of these, only *Oliva* is present at Ejutla in any quantity above a half dozen. Other small gastropods are present in very low numbers at both sites, but most are proportionately much more common at Monte Albán, given the much greater quantities of shell overall at Ejutla (see Tables 8.3 and 8.8), such as cone shells (*Conus* sp.), cowrie shells (*Cypraea* sp.), marginellas (*Marginella* sp., *Persicula* sp.), dove shells (*Mitrella* sp., *Pyrene* sp.), dogwinkles

Table 8.6. The shell assemblage at Monte Albán by class.

All analyzed collections at Monte Albán					
Shell category	**Bivalve**	**Gastropod**	**Scaphopod**	**Unidentified**	**Total**
broken shell	1143	229	–	53	1425
worked shell	936	62	–	4	1002
whole shell (unmodified)	81	90	–	2	173
unfinished ornament	221	51	–	5	277
finished ornament	418	295	1	228	942
total	2799	727	1	292	3819
Non-shell-working areas					
Shell category	**Bivalve**	**Gastropod**	**Scaphopod**	**Unidentified**	**Total**
broken shell	487	194	–	47	728
worked shell	196	49	–	4	249
whole shell (unmodified)	80	83	–	2	165
unfinished ornament	133	46	–	5	184
finished ornament	355	269	1	227	852
total	1251	641	1	285	2178
Shell-working area on the west side of the North Platform					
Shell category	**Bivalve**	**Gastropod**	**Scaphopod**	**Unidentified**	**Total**
broken shell	656	35	–	6	697
worked shell	740	13	–	–	753
whole shell (unmodified)	1	7	–	–	8
unfinished ornament	88	5	–	–	93
finished ornament	63	26	–	1	90
total	1548	86	–	7	1641

Table 8.7. Shell species at Monte Albán.

Bivalves		
Genus	**Species**	**Common name**
Anadara	*mazatlanica* (?)	ark shell
Arca	*pacifica*	ark shell
Barbatia (?)	sp.	ark shell
Chama	*buddiana*	jewel box
Chama	*echinata* (*C. coralloides*)	jewel box
Chama	*frondosa* (?)	jewel box
Chama	*squamuligera* (?)	jewel box
Choromytilus	*palliopunctatus* (?)	mussel
Donax	*navicula* (?)	bean clam
Donax	*transversus* (?)	bean clam
Dosinia (?)	sp.	Venus clam
Glycymeris	*gigantea*	bitterweet shell
Lophocardium (?)	sp.	?
Lucina	sp.	lucine
Macoma	*siliqua* (?)	macoma
Mactrellona	*clisia*	surf clam
Margaritifera (?)	sp.	freshwater mussel
Ostrea	*conchaphila*	oyster
Ostrea	*fisheri*	fisher's oyster
Ostrea	*iridesens*	oyster
Ostrea	*palmula*	oyster
Periglypta	*multicostata*	Venus clam
Pinctada	*mazatlanica*	pearly oyster
Pitar	*frizzelli*	pearly oyster
Pitar	*lupanaria* (?)	Venus clam
Pitar	*tortuosus* (?)	Venus clam
Polymesoda (?)	sp.	marsh clam
Protothaca	sp.	Venus clam
Pteria	*sterna* (?)	winged oyster
Sanguinolaria	sp.	gari shell
Spondylus	*calcifer* (*S. limbatus*)	spiny oyster
Spondylus	*princeps* (*S. crassisquama*)	spiny oyster
Tagelus (?)	sp.	gari shell
Tellina	sp.	tellin
Tivela	*delessertii* (?)	Venus clam

(*Continued*)

Tivela	*planulata*	Venus clam
Trachycardium	*consors*	cockle shell
Ventricolaria	*isocardia* (?)	Venus clam
Gastropods		
Genus	**Species**	**Common name**
Acmaea	*discors*	small limpet
Acmaea	*fascicularis*	small limpet
Acmaea	*pediculus*	small limpet
Agaronia	*propatula*	olive shell
Agaronia	*testacea*	olive shell
Anachis	*scalarina*	dove shell
Astraea	*olivacea*	olive turban
Astraea	*unguis*	turban
Cassis	*madagascarensis*	helmet
Cassis	*tenius* (?)	helmet
Cassis	*tuberosa* (?)	helmet
Cerithidea	*albonodosa*	horn shell
Cerithidea	*montagnei* (?)	horn shell
Cerithium	*stercusmuscarum*	horn shell
Conus	*fergusoni*	cone shell
Conus	*nux* (?)	cone shell
Conus	*purpurascens* (?)	cone shell
Conus	*regularis*	cone shell
Conus	*virgatus* (?)	cone shell
Conus	*princeps*	cone shell
Crepidula	*aculeata*	prickly slipper shell
Crucibulum	*scutellatum*	cup and saucer limpet
Cymatium	*lignarium*	triton
Cymatium	*wiegmanni*	triton
Cypraea	*arabicula*	cowrie
Cypraea	*cervinetta*	cowrie
Diodora	*inaequalis*	keyhole limpet
Engina	*pulchra*	small whelk
Ficus	sp.	fig shell
Fissurella	*gemmata*	keyhole limpet
Fissurella	*longifissa* (?)	keyhole limpet
Fissurella	*rugosa* (?)	keyhole limpet
Fossarus	sp.	fossarus
Fusinus	sp.	spindle shell
Haliotis	*fulgens*	green abalone
Haliotis	*rufrescens*	red abalone
Hexaplex (?)	sp.	rock shell
Janthina	*globosa or prolongata*	violet snail
Jenneria	*pustulata*	sea button
Lamellaria	*inflata*	wide-mouth snail
Latirus	*ceratus*	tulip shell
Latirus	*socorroensis*	tulip shell
Littorina	*conspersa*	periwinkle
Malea	*ringens*	cask shell
Marginella	*apicina*	marginella
Marginella	*curta*	marginella
Mitrella	*delicata*	dove shell
Mitrella	*lalage*	dove shell
Morum	*tuberculosum*	helmet
Muricanthus	*princeps* (?)	rock shell
Nassarius	*luteostoma* (?)	dog whelk
Natica	*chemnitzi* (?)	moon shell
Natica	*broderipiana* (?)	moon shell
Nerita	*scabricosta*	nerite
Neritina	*meleagris*	nerite
Neritina	*reclivata*	nerite
Oliva	*incrassata*	olive shell
Oliva	*polpasta*	olive shell
Oliva	*porphyria*	olive shell
Oliva	*splendidula* (?)	olive shell
Olivella	*alba* (?)	olive shell
Olivella	*dama*	olive shell
Olivella	*gracilis* (?)	olive shell
Olivella	*morrisoni* (?)	olive shell
Olivella	*volutella* (?)	olive shell
Olivella	*walkeri* (?)	olive shell
Olivella	*zanoeta* (?)	olive shell
Patella	*mexicana* (*Ancistromesus mexicanus*)	giant limpet
Persicula	*imbricata* (?)	marginella
Petaloconchus	*flavescens* (?)	worm shell
Planaxis	*obsoletus*	grooved snail
Pyrene	*fuscata*	dove shell
Pyrene	*lucasana*	dove shell
Pyrene	*major*	dove shell
Siphonaria (?)	sp.	false limpet
Strombus	*galeatus*	conch shell
Strombus	*gracilior*	conch shell
Tegula	sp.	pearly top shell
Terebra (?)	sp.	auger shell
Thais	*biserialis* (?)	dogwinkle
Thais	*speciosa*	dogwinkle
Thais	*triangularis*	dogwinkle
Trivia	*radians* (?)	sea button
Turritella	*leucostoma*	turret
Scaphopods		
Dentalium	*pretiosum* (?)	tusk shell

Table 8.8. Quantity of each shell genus identified at Monte Albán.

Class	Genus	Quantity
Bivalve	*Anadara*	5
Bivalve	*Arca*	1
Bivalve	*Barbatia*	1
Bivalve	*Chama*	289
Bivalve	*Choromytilus*	1
Bivalve	*Donax*	8
Bivalve	*Dosinia* (?)	1
Bivalve	*Glycymeris*	3
Bivalve	*Lophocardium* (?)	1
Bivalve	*Lucina*	1
Bivalve	*Macoma*	1
Bivalve	*Mactrellona*	1
Bivalve	*Margaritifera* (?)	3
Bivalve	*Ostrea*	5
Bivalve	*Periglypta*	1
Bivalve	*Pinctada*/nacreous	2290
Bivalve	*Pitar*	3
Bivalve	*Polymesoda/Cyrenoida*	2
Bivalve	*Protothaca*	1
Bivalve	*Pteria*	3
Bivalve	*Sanguinolaria*	1
Bivalve	*Spondylus*	93
Bivalve	*Tagelus* (?)	1
Bivalve	*Tellina*	4
Bivalve	*Tivela*	3
Bivalve	*Trachycardium*	1
Bivalve	*Ventricolaria*	1
Gastropod	*Acmaea*	12
Gastropod	*Agaronia*	14
Gastropod	*Anachis*	1
Gastropod	*Astraea*	8
Gastropod	*Cassis*	4
Gastropod	*Cerithidea*	7
Gastropod	*Cerithium*	4
Gastropod	*Conus*	13
Gastropod	*Crepidula*	1
Gastropod	*Crucibulum*	5
Gastropod	*Cymatium*	2
Gastropod	*Cypraea*	13
Gastropod	*Diodora*	3
Gastropod	*Engina*	1
Gastropod	*Ficus*	1
Gastropod	*Fissurella*	13
Gastropod	*Fossarus*	1
Gastropod	*Fusinus*	1
Gastropod	*Haliotis*	8
Gastropod	*Hexaplex* (?)	2
Gastropod	*Janthina*	1
Gastropod	*Jenneria*	2
Gastropod	*Lamellaria*	1
Gastropod	*Latirus*	6
Gastropod	*Littorina*	1
Gastropod	*Malea*	4
Gastropod	*Marginella*	33
Gastropod	*Mitrella*	19
Gastropod	*Morum*	6
Gastropod	*Muricanthus*	2
Gastropod	*Nassarius*	2
Gastropod	*Natica*	2
Gastropod	*Nerita*	3
Gastropod	*Neritina*	7
Gastropod	*Oliva*	106
Gastropod	*Olivella*	101
Gastropod	*Patella*	9
Gastropod	*Persicula*	2
Gastropod	*Petaloconchus*	2
Gastropod	*Planaxis*	1
Gastropod	*Pyrene*	9
Gastropod	*Siphonaria* (?)	1
Gastropod	*Strombus*	14
Gastropod	*Tegula*	2
Gastropod	*Terebra* (?)	1
Gastropod	*Thais*	9
Gastropod	*Trivia*	2
Gastropod	*Turritella*	70
Scaphopod	*Dentalium*	1

(*Thais* sp.), horn shells (*Cerithidea* sp., *Cerithium* sp.), sea buttons (*Jenneria* sp., *Trivia* sp.), moon shells (*Natica* sp.), turban shells (*Astraea* sp.), pearly top shells (*Tegula* sp.), nerites (*Nerita* sp., *Neritina* sp.), helmets (*Morum* sp.), periwinkles (*Littorina* sp.), and dog whelks (*Nassarius* sp.). Two small limpets are present at both sites (*Acmaea* sp. and *Fissurella* sp.); others are present only at Monte Albán (*Crucibulum* sp., *Diodora* sp.). Many of these small limpets have natural holes that were enlarged for stringing. For all these genera, the same species often are not present at both sites. These small shells may have been traded to Monte Albán and Ejutla by various routes.

An important difference between the shell assemblages at Ejutla and Monte Albán is the much greater proportion of ornaments at Monte Albán (32% vs. 4.3% at Ejutla) and especially finished ornaments, approximately one-quarter of the assemblage (24.7%) at Monte Albán compared to <1% at Ejutla (see Tables 8.1 and 8.6). The Monte Albán shell ornament assemblage is dominated by beads (47%), pendants (19%), and placas (26%). Most of the beads are

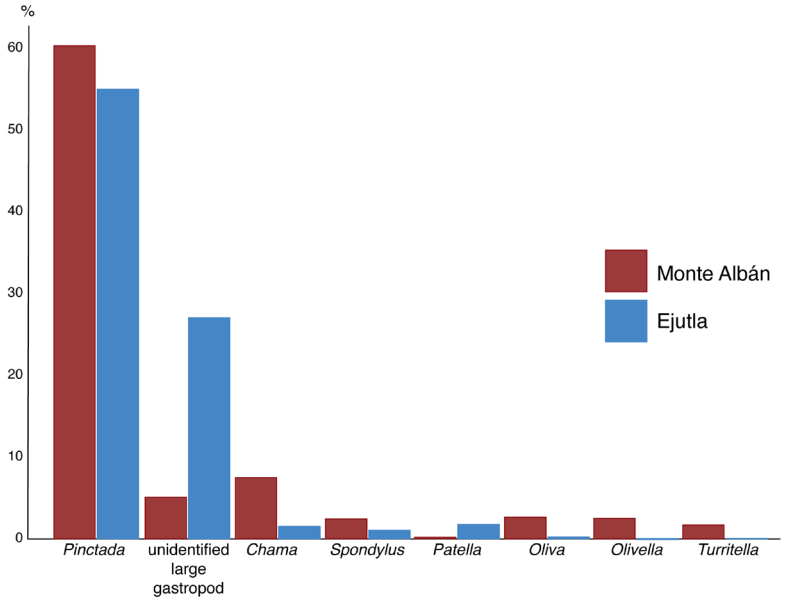

Figure 8.30. Comparison of principal shell genera at Monte Albán and Ejutla by percentage (only includes taxa that are at least 1% at one of the two sites).

Figure 8.31. Sample of *Pinctada* placas from Monte Albán.

formed thin disk beads (mostly matte white and some *Pinctada*) and larger tabular beads (mostly *Pinctada*) (Figure 8.34), and whole shell beads (small gastropods) (Figure 8.35). Most of the beads are finished. The majority of the pendants are natural small gastropods that have been perforated (see Figure 8.35); the remaining formed pendants have a variety of quadrangular and curvilinear forms, with tabular or rectangular more common than other shapes (see Figure 8.32). Most of the formed pendants were made from *Pinctada*. Over 75% of the pendants are finished, whereas fewer than half of the placas are finished. Most placas were also made of *Pinctada*, in a wide variety of shapes, with triangles, rectangles, trapezoids, diamonds, and crescents the most common (Table 8.10). Some of the placas could be unperforated bead blanks, along with a small number of shell disks, while finished placas and disks could have been used as mosaic inlay.

There is less broken and worked shell at Monte Albán, approximately 63% of the assemblage compared to more than 95% at Ejutla. These differences in quantities of ornaments and shell debris are not surprising given the contexts from which much of the shell was collected at Monte Albán, whereas the shell from Ejutla comes exclusively from a shell-working context. The differences are even greater when we separate out the shell from the Conjunto Plataforma Norte Lado Poniente, an area where shell working occurred, based on the nature of the shell assemblage (see also Martínez López and Markens 2004). That one context alone (n = 1643, wgt. = 2.5 kg) accounts for 43% of all the shell that we analyzed at Monte Albán. For the rest of the shell assemblage at Monte Albán, ornaments account for almost half (48%) of the assemblage, with many more finished ornaments (39%) than unfinished ones (8.4%). These contexts were clearly receiving shell ornaments crafted elsewhere, either on site or from afar, and were not making ornaments in any large numbers.

In many respects, the assemblage from the complex on the west side of the North Platform looks a lot like the assemblage in the domestic shell-working area at Ejutla (see Appendix 7, Figure 8.36). Approximately 11% are ornaments, about half finished and half unfinished. The most common ornaments are placas (>60%). There also are high quantities of worked shell (46%) and unworked broken shell (42%). But shell working in this context was limited almost entirely to nacreous shell, primarily *Pinctada*, which accounts for 92% of the shell here (n =

Figure 8.32. Nacreous beads and pendants from Monte Albán.

1510), plus more than 1000 tiny flakes or chipping debris weighing only 200 g that we do not include in the total count; many of these tiny pieces may have simply flaked off of larger nacreous debris or broken ornaments (compared to Ejutla, where nacreous shell was 61% of all shell, with 4.3 kg of uncounted chipping debris). There are only a few pieces of *Spondylus* (n = 6) and *Chama* (n = 15), mostly broken fragments with no evidence of working and a few ornaments. Gastropods are fairly evenly divided between small snail shells (42 comprising 17 different genera, with more *Olivella* and *Turritella* than the others) and larger gastropods (44, most unidentified but a few *Strombus*), both ~2.5% of the assemblage. The craftworkers may have perforated small snail shells for stringing, but given the very low amounts of modified fragments from large gastropods in this context, there is minimal evidence that the large shells were crafted into ornaments for exchange in this context.

In analyzing the shell from the west side of the North Platform, and the ornaments from the other contexts, we saw the same techniques that the Ejutleño artisans used to craft ornaments (e.g., Feinman and Nicholas 2000), including techniques that Melgar Tísoc et al. (2010, 2018) have documented through experimental analyses at Monte Albán—cutting shell with sharp obsidian and chert blades and flakes, perforating beads and pendants with small chert drills and pointed flakes, and shaping ornaments with basalt abraders. These techniques have been documented elsewhere in Mesoamerica (Emery and Aoyama 2007; Suárez 1977, 1981; Velázquez Castro et al. 2019) and are not unique to Oaxaca, Ejutla, or Monte Albán. While many placas and worked debris have string-cut edges, many others were cut with sharp-edged stone tools. The edges of many placas were abraded very smooth, removing any evidence of whether string or a stone tool was used initially to cut the ornament blank. Regardless of the tools used, many placas are very similar to those we found at Ejutla. There were only a few disks (12) in this context, proportionally many fewer than in Ejutla; most were abraded, but two had been cut with a tubular drill (most likely cane), and several pieces of discarded worked shell have cut marks made with a tubular drill. There were approximately two dozen each of beads and pendants, accounting for ~25% of the ornaments in this context, half of which are small whole gastropods perforated for stringing by abrading (often with string) an opening in the shell wall, or in thinner shells by punching a hole in the shell wall or cutting off the top of the spire. Formed beads were abraded, while pendants were formed by cutting with string or a sharp stone tool, and then abrading the edges smooth. Given the low number of disks, the craftworkers' main focus appears to have been on making tabular pieces that were finished into pendants, beads, or mosaic inlay. Mixed with the shell debris were hundreds of blades and flakes of obsidian, chert, and quartz, and a small number of perforators (Martínez López and Markens 2004, 85). The obsidian blades were well used, like those at Ejutla (see also Lewenstein 1987). The presence of rejuvenation flakes indicates resharpening of blades and perforators as

Table 8.9. Shell ornaments by genus at Monte Albán.

Genus	Bead	Bead/ pendant	Bracelet	Button	Cube	Disk	Earspool	Ornament blank	Pearl	Pectoral	Pendant	Placa	Ring	Trumpet	Unknown ornament	Whole shell	Total
Bivalve	**186**	**3**	**5**	**5**	**1**	**31**	**–**	**11**	**1**	**2**	**108**	**280**	**1**	**–**	**5**	**81**	**720**
Arca	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Chama	1	–	–	–	–	–	–	1	–	–	4	–	–	–	–	64	70
Chama (?)	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Choromytilus (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Donax	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2
Glycymeris	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Glycymeris (?)	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Macoma (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Margaritifera (?)	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	2
nacreous/*Pinctada*	71	3	–	4		21	–	3	–	–	54	195	–	–	5	–	356
Ostrea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2
pelecypod UID	2	–	–	–	–	1	–	–	1	–	3	–	–	–	–	6	13
Pinctada	96	–	2	1		7	–	2	–	1	16	34	–	–	–	1	160
Pinctada (?)	9	–	–	–	–	2	–	3	–	1	22	32	1	–	–	–	70
Pitar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Polymesoda (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Pteria (?)	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1
Spondylus	3	–	–	–	1	–	–	2	–	–	6	18	–	–	–	–	30
Spondylus (?)	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Tivela	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Gastropod	**178**	**–**	**3**	**–**	**–**	**4**	**2**	**13**	**–**	**–**	**117**	**23**	**4**	**1**	**1**	**90**	**436**
Acmaea	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	4	5
Acmaea (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Agaronia	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	–	5
Agaronia (?)	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	2
Agaronia/Oliva	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Agaronia/Olivella	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Anachis	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Astraea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Cerithidea	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	4	6

Genus	Bead	Bead/ pendant	Bracelet	Button	Cube	Disk	Earspool	Ornament blank	Pearl	Pectoral	Pendant	Placa	Ring	Trumpet	Unknown ornament	Whole shell	Total
Cerithidea (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Cerithium	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	2	3
Conus	–	–	–	–	–	–	–	–	–	–	6	–	–	–	1	–	7
Crepidula	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Crucibulum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	3
Cypraea	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	2
Diodora	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	2
Diodora (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Engina	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Ficus	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1
Fissurella	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	5	9
Fissurella (?)	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Fossarus	–	–	–	–	–	–	–	–	–	–	–		–	–	–	1	1
gastropod UID	29	–	–	–	–	2	2	9	–	–	7	19	4	–	–	–	72
Haliotis	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1
Hexaplex (?)	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1
Jenneria	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Lamellaria	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Latirus	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	4	5
Littorina	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Malea (?)	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Marginella	29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	32
Mitrella	14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	15
Mitrella (?)	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Morum	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–	–	5
Nassarius	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2
Natica (?)	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Nerita	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	3
Neritina	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	7
Oliva	1	–	–	–	–	–	–	–	–	–	56	–	–	–	–	2	59
Oliva (?)	–	–	–	–	–	1	–	–	–	–	4	–	–	–	–	–	5

(*Continued*)

Genus	Bead	Bead/ pendant	Bracelet	Button	Cube	Disk	Earspool	Ornament blank	Pearl	Pectoral	Pendant	Placa	Ring	Trumpet	Unknown ornament	Whole shell	Total
Olivella	85	–	–	–	–	–	–	–	–	–	1	–	–	–	–	5	91
Olivella (?)	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Patella	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	1	3
Patella (?)	–	–	2	–	–	–	–	1	–	–	–	–	–	–	–	–	3
Persicula	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Planaxis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Pyrene	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	6
Siphonaria (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Strombus	–	–	–	–	–	–	–	2	–	–	2	2		1	–	1	8
Tegula (?)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Thais	6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	7
Turritella	–	–	–	–	–	–	–	–	–	–	9	–	–	–	–	33	42
Scaphopod	**1**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**1**
Dentalium	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Unidentified	**213**	**–**	**3**	**–**	**–**	**1**		**1**	**–**	**–**	**6**	**8**	**–**	**–**	**1**	**2**	**235**
Total	**578**	**3**	**11**	**5**	**1**	**36**	**2**	**25**	**1**	**2**	**231**	**311**	**5**	**1**	**7**	**173**	**1392**

Figure 8.33. *Spondylus* placas from Monte Albán.

Figure 8.34. *Pinctada* disks and tabular beads from Monte Albán.

Figure 8.35. Whole shell beads and pendants at Monte Albán, small olive and marginella shells (top) and *Oliva porphyria* (bottom).

Table 8.10. Types of shell ornaments at Monte Albán by class.

Ornament category	Bivalves	Gastropods	Scaphopods	UID	Total
Bead	**186**	**178**	**1**	**213**	**578**
cylindrical	6	2	–	1	9
flat disk	7	18	–	184	209
miniature	3	8	–	17	28
other form	10	2	1	11	24
tabular	159	–	–	–	159
whole shell bead	1	148	–	–	149
Bead/pendant	**3**	**–**	**–**	**–**	**3**
Bracelet	**5**	**3**	**–**	**3**	**11**
Button	**5**	**–**	**–**	**–**	**5**
Cube	**1**	**–**	**–**	**–**	**1**
Disk	**31**	**4**	**–**	**1**	**36**
abraded disk	19	4	–	1	24
tubular cut	12	–	–	–	12
Earspool	**–**	**2**	**–**	**–**	**2**
Ornament blank	**11**	**13**	**–**	**1**	**25**
Pearl	**1**	**–**	**–**	**–**	**1**
Pectoral	**2**	**–**	**–**	**–**	**2**
Pendant	**108**	**117**	**–**	**6**	**231**
anthropo/zoomorphic	15	3	–	2	20
circular	11	–	–	1	12
cruciform	–	–	–	1	1
dagger-shaped	2	–	–	–	2
engraved	5	1	–	–	6
irregular	5	1	–	–	6
J-shaped	2	1	–	–	3
other angular form	2	–	–	–	2
other shape	4	2	–	–	6
rectangular	18	1	–	–	19
ring-shaped	1	1	–	–	2
square	4	–	–	–	4
tabular	19	2	–	2	23
teardrop	1		–	–	1
trapezoidal	6	1	–	–	7
triangular	7	–	–	–	7
whole shell pendant	6	104	–	–	110
Placa	**280**	**23**	**–**	**8**	**311**
anthropo/zoomorphic	7	–	–	1	8
arrow-shaped	8	1	–	–	9
circular	3	1	–	–	4
crescent	13	1	–	–	14
cruciform	1	–	–	–	1
curvilinear	4	2	–	–	6
engraved/incised	4	1	–	–	5
flower	1	1	–	–	2
irregular	25	1	–	3	29
letter-shaped	14	–	–	–	14
notched/serrated	9	1	–	1	11

Ornament category	Bivalves	Gastropods	Scaphopods	UID	Total
other angular	9	1	–	–	10
rectangular	64	4	–	1	69
square	13	–	–	–	13
star-shaped	1	–	–	–	1
tabular	22	4	–	–	26
teardrop	2	–	–	1	3
trapezoidal	12	2	–	–	14
triangular	62	3	–	–	65
unclear form	6	–	–	1	7
Ring	**1**	**4**	**–**	**–**	**5**
Trumpet	**–**	**1**	**–**	**–**	**1**
Unknown ornament	**5**	**1**	**–**	**1**	**7**
Unmodified whole shell	**81**	**90**	**–**	**2**	**173**
Total	**720**	**436**	**1**	**235**	**1392**

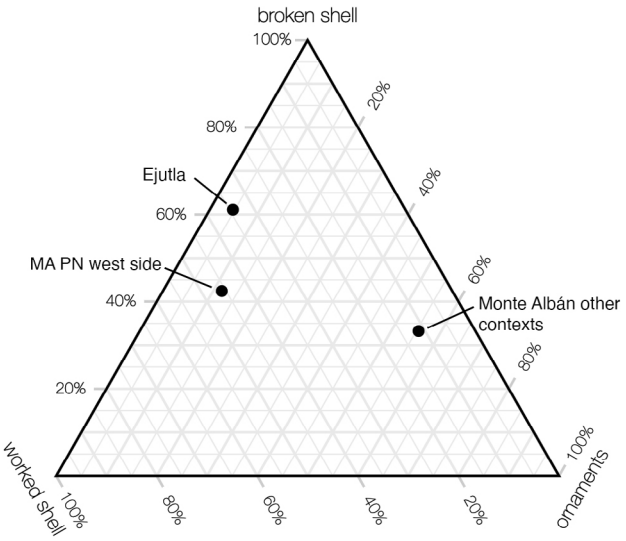

Figure 8.36. Ternary chart showing proportions of ornaments, worked shell, and broken shell at Ejutla, the shell-working area on the west side of the North Platform, and all other contexts at Monte Albán.

they were worn down by working the hard shell. There was much less ground stone, only 17 hammerstones to break up the shells, most of which are chert, and many fewer other forms, such as manos, polishers, anvils, axes, or chisels (Martínez López and Markens 2004, 88–89). It is not clear from the reporting how many, if any, of the other tools are basalt.

Because of the limited evidence that the shell workers in the Conjunto Plataforma Norte Lado Poniente worked shell genera other than *Pinctada* and the high volume of shell ornaments in the collections we analyzed at Monte Albán, we suspect that many of those ornaments were made elsewhere at Monte Albán, or at another shell-working site. There is minimal evidence that shell working was carried out in any of the other archaeological contexts we analyzed, or at least it did not occur at scale. During the survey of Monte Albán, Richard Blanton (1978, 77–79) recorded sparse quantities of shell on ~6% of all terraces spread across Monte Albán; he also identified several possible shell-working areas by denser than usual quantities of shell on the surface, in his words, "that 10 or more pieces could be sighted in a small area immediately and that if a surface collection were to be made hundreds or even thousands of pieces could be picked up."

All of the terraces with possible shell working are on Monte Albán's main hill, on several sides of the Main Plaza (Blanton 1978, figure 4.29). All are on residential terraces, several of which are clustered in what appear to be small barrios of artisans who crafted shell ornaments (Figure 8.37). The largest cluster includes five terraces with abundant surface shell off the southwest corner of the Main Plaza. Several other shell-working terraces are below the eastern side of the Main Plaza, and another one is to the north. Although none of these areas have been investigated further, they remain possible sources for the shell ornaments that we analyzed from the contexts on the Main Plaza.

Yet just because shell working occurred in at least one context at Monte Albán, that does not rule out the possibility that shell ornaments crafted elsewhere were traded to Monte Albán. As an example, ceramic production is well documented at Monte Albán (e.g., Markens and Martínez López 2009), yet a compositional analysis of ceramics from across the valley found that a small amount of pottery at Monte Albán was not made at the site itself (Minc et al. 2015). The same pattern was even clearer at El Palmillo, where we found several small ceramic firing features; most of the tested pottery was made from clays near El Palmillo, yet 18% was made from clays in western Tlacolula. Local production of a good does not preclude all residents of a site from obtaining similar classes of that good produced elsewhere.

Given the similarity in the species, the techniques used to work the shell, and the kinds of ornaments in both

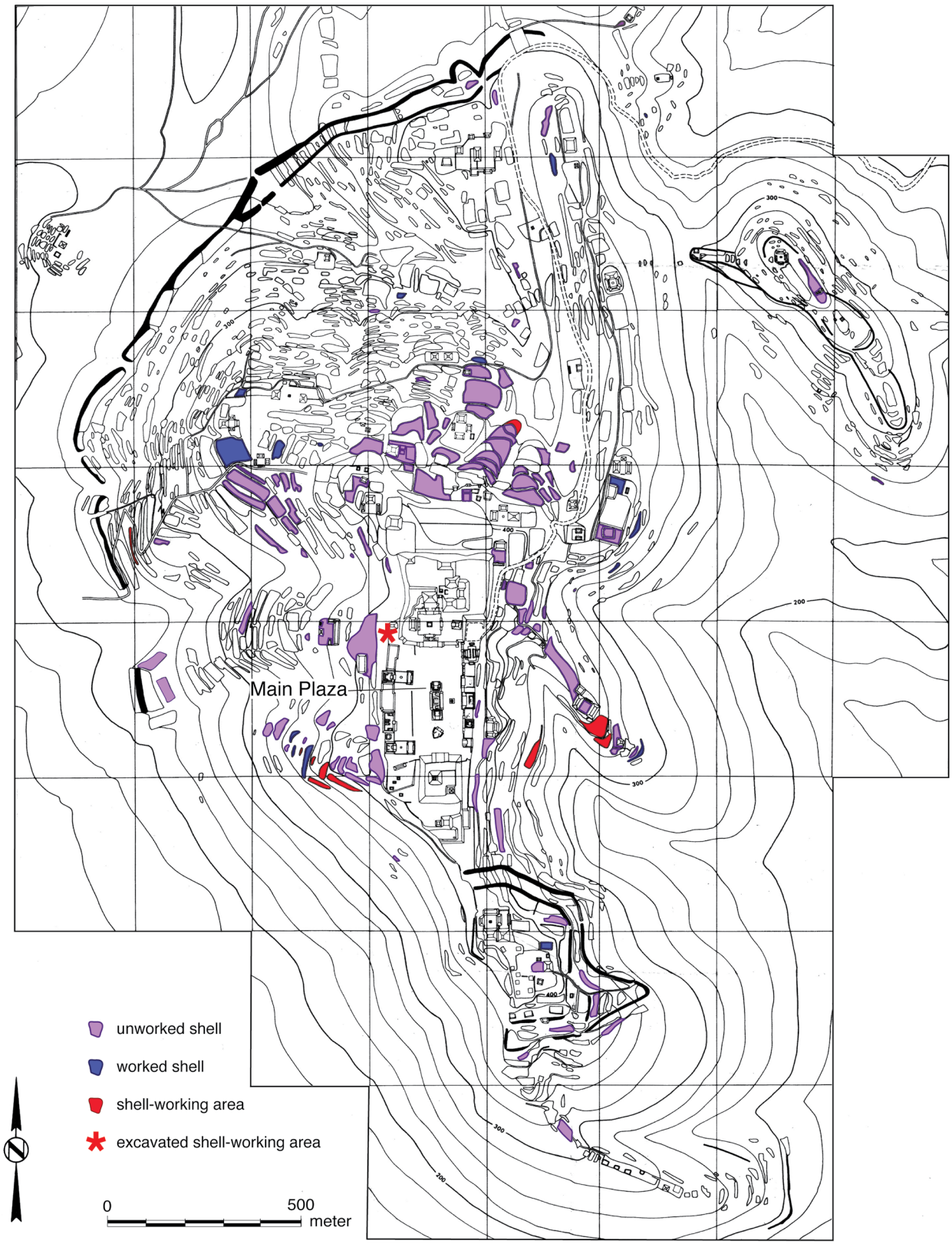

Figure 8.37. Map of Monte Albán, showing location of the Main Plaza, areas where shell and indications of shell working were found during the surface survey of the site (data from Blanton 1978, appendix 1), and the excavated shell-working area on the west side of the North Platform.

contexts, we also cannot rule out that some of the shell at Monte Albán came from Ejutla, including beads or other ornaments made from large gastropods, as well as blanks and unworked shell (e.g., Feinman and Nicholas 1995c, 2000; contra Melgar Tísoc et al. 2010, 2018). The amount of broken gastropod debris at Ejutla far exceeded the number of (even partial) ornaments. These larger and heavier shells may have been more difficult to transport and so were at least initially broken and processed at Ejutla; this would help explain the high amounts of unworked debris from

these large shells at Ejutla. At Ejutla, large gastropods account for 30% of the shell assemblage, with only 3.5% finished or unfinished ornaments compared to 20% in the Conjunto Plataforma Norte Lado Poniente. *Spondylus* and *Chama*, both as unworked shells and as ornaments, also may have arrived at Monte Albán by way of Ejutla.

Surveys and excavations in the Valley of Oaxaca have found few sites with high-intensity shell working. Shell was recorded on the surface of only 20 sites during surveys in the Valley of Oaxaca (out of 2700, including Monte Albán; Kowalewski et al. 1989). The relative abundance of surface shell was greater in the southern parts of the central valleys, 21 out of 423 sites in Ejutla (Feinman and Nicholas 1992, 1993) and 8 out 120 sites in the Sola Valley (Balkansky 2002; Nicholas and Feinman 2002). At most sites only one or two pieces of shell were noted.

Only at Monte Albán and Ejutla have dense surface scatters of marine shell been recorded and then (through subsequent excavation and analysis) shell working documented. Although shell ornaments and broken debris are not rare finds in our excavations at El Palmillo, Lambityeco, and the Mitla Fortress (Feinman and Nicholas 2009, 2011b, 2016b) or those of colleagues elsewhere in the valley (Feinman and Nicholas 2007e), the quantities are generally very low, and there is no evidence of shell working at any level of intensity. Shell ornaments generally are more abundant in higher-status contexts but have been found in non-elite houses (Feinman and Nicholas 2009, 2011b) and in child burials (González Licón 2009; Feinman and Nicholas 2007e).

In spite of high-intensity shell ornament production at Ejutla, there was only one bead in the tomb and only a few other finished shell ornaments in the house, including the two carved pendants (see Figure 8.27). This household and the local community were not consuming most of the shell ornaments made by the Ejutla craftworkers, in contrast to artisans at the Xalla palace at Teotihuacan (Velázquez Castro et al. 2019) or the Maya sites of Aguateca and Tikal (Inomata and Emery 2014; Moholy-Nagy 2008) or at Monte Albán, where finished ornaments were a far larger component of shell assemblages. So, for whom were the Ejutla artisans making the ornaments? Consumers at Monte Albán are one reasonable answer. Given that shell ornaments are most frequently found in elite contexts at Monte Albán and other sites in the valley, including El Palmillo, where we excavated low- and high-status houses, it does not seem likely that the large quantity of shell ornaments made in Ejutla were traded only to nearby communities, all of which were much smaller than Ejutla. One could presume that at least some of the ornaments were crafted for higher-status individuals who lived closer to the site's core in the center of the modern town, where we mapped a ceremonial complex of mounds during the regional survey. Nevertheless, although we were able to collect pottery as we investigated the heavily damaged mounds and surrounding areas, we did not recover a single piece of shell, much less any ornaments. Sourcing studies of obsidian and mica help define prehispanic networks and routes that appear to provide some conceivable answers.

8.7. Obsidian and Travel Routes to the Pacific Coast

In 2012 we started sourcing the obsidian from our excavations using portable XRF (X-ray fluorescence), and now we have sourced more than 20,000 pieces of obsidian from more than 50 archaeological sites in the state of Oaxaca (Nicholas et al. 2022). There are no obsidian sources in the entire state of Oaxaca, so all obsidian arrived via long-distance exchange (Figure 8.38). We found that obsidian was moving long distances as early

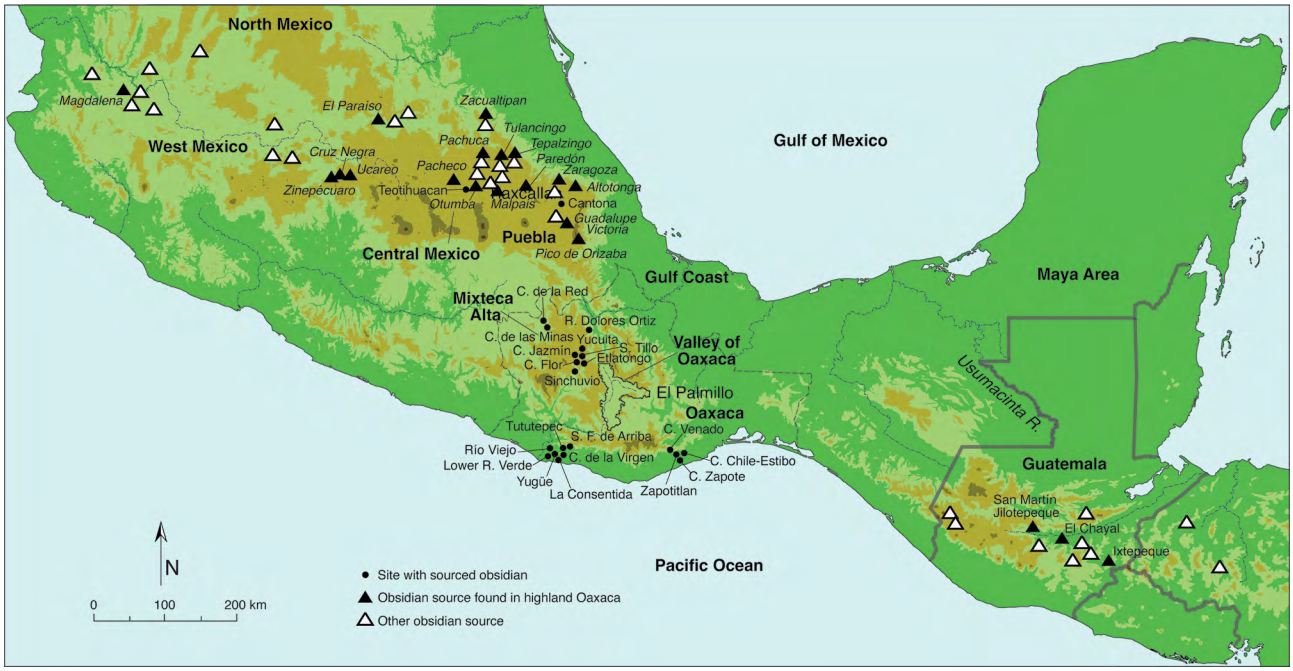

Figure 8.38. Map of Mesoamerican obsidian sources and sites with sourced obsidian (see Figure 8.39 for sites in the Valley of Oaxaca).