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FLAKED STONE FROM ISTHMIA

ABSTRACT

Archaeologists have long acknowledged the importance of flaked stone tools in the prehistoric archaeological record of the Aegean. Over the past two decades, scholars have demonstrated the continued production and use of lithics in historical periods as well. At Isthmia, flaked stone tools have been found in deposits associated with craft, agricultural, ritual, and domestic contexts. The presence of reduction debris as well as finished tools of obsidian and chert suggests some on-site production in historical eras, but recycling of older pieces is also possible. The assemblage reflects a pragmatic response to the need for cutting, scraping, and incising tools in various periods.

Excavators at Isthmia have retrieved flaked stone tools, mostly of obsidian, since the first season of digging. Although the sample of 149 lithics is relatively small, the material has been found in a variety of contexts.[1] In the past, classical archaeologists have had a tendency to classify flaked lithics in historical levels as intrusive from prehistoric strata. This interpretation

1. The present report includes material from both the University of Chicago and the University of California, Los Angeles/Ohio State University (UCLA/OSU) excavations at the site from the Bronze Age through the Late Medieval phase, providing the temporal depth necessary to examine technological evolution. Timothy Gregory, director of the OSU excavations at Isthmia, and Elizabeth Gebhard, director of the University of Chicago Isthmia excavations, provided both the encouragement and the opportunity to undertake a systematic examination of the stone tools. They offered necessary access to the material and excavation records and carefully read earlier drafts of this article. Gebhard, Virginia Anderson-Stojanović, and Martha Risser provided important information about the contexts of the Chicago material from their studies of the pottery from various sections. Jean Perras helped me to locate the lithics in the University of Chicago excavations storage areas and answered questions about information in the database. I thank Michael Bootsman for his photograph (Fig. 3) and Michel Huijsing for the drawings of artifacts (Figs. 2, 4). Heather Gayheart (Kenyon College) coded all the information and entered data on computer files. She also searched all the UCLA notebooks at Isthmia for references to flaked stone that was noted and discarded. I received able assistance from College of Wooster students Andrew Womack, Aubrey Brown, and Chelsea Fisher, who helped format the manuscript, scan figures, and proofread the entire document. James Foradas provided insights into the formation of chert and flint related to the problem of identifying sources through chemical analysis. William Parkinson, Curtis Runnels, and two anonymous *Hesperia* reviewers provided important comments to guide revisions, as did the journal editor, but they bear no responsibility for the interpretations I adopt.

Funding from Kenyon College and the College of Wooster made it possible to spend parts of various summers between 1994 and 2001 on the study of the lithics at Isthmia.

may be incorrect for some sites. Runnels has demonstrated the survival of flaked stone tool technology from the Bronze Age through the Archaic and Classical periods, both through the production of new implements and the reuse or recycling of old ones.[2] The production of threshing sledge flints persisted into the 20th century in Turkey,[3] Cyprus, and various parts of Greece.[4] The lithic assemblage from Isthmia offers a valuable opportunity to investigate this phenomenon in a setting that spans a number of chronological periods. My concern is to delineate, where possible, the technology and organization of production, the particular functions of the stone tools, and the diversity of craft activity at the site.

While the analysis of lithics has become an increasingly important aspect of prehistoric studies in Greece,[5] lithics are generally treated as minor objects and receive little interpretation in research at major historical sites. The general inclination to assign flaked stone to prehistoric contexts, while justified to some extent by the quantity of such material found in Bronze Age and earlier levels, imposes a considerable bias on the material evidence. It also limits potential insights into technological developments and economic processes. Although some aspects of lithic technology changed very little over long periods of time, in view of the constant importance of certain functional attributes it would be a mistake to assume that lithic technology was static. Becwse of the relative lack of plasticity of stone compared to other media such as clay, however, the nature of change in lithic technology is often hidden in subtle alterations. The production of stone tools in Greece and the Balkans followed a distinct trajectory from the Palaeolithic through the 1st millennium A.D. that is traceable through the careful examination of morphological traits.[6]

Stone tools, moreover, have the potential to reveal important aspects of both political and domestic economy. Among the advantages that such tools possess is their lower cost compared to metal implements and the local availability of raw materials and craftsmen. Their use allows rural communities to exercise greater control of key technological resources. Thus, it should be no surprise that flaked stone tools remained important components of subsistence and craft activities not only in prehistoric but also in historical periods in Greece.

The study of the stone tools from Isthmia and related work on the flaked stone material from the Lower Town at Halieis are designed to

2. Runnels 1982.

3. Bordaz 1969; Ataman 1999.

4. Pearlman 1984; Fox 1985; Kardulias and Yerkes 1996.

5. E.g., Torrence 1986; Perlès 1987; Blitzer 1992; Karimali 1994; Runnels 1994; Kozlowski, Kaczanowska, and Pawlikowski 1996; Parkinson 1999; Hartenberger and Runnels 2001.

6. Distinct types are characteristic of different periods in Greece and elsewhere in Europe. In general, Middle Palaeolithic tools of the Mousterian tradition include unifacial points, various scrapers, and notches. The Upper Palaeolithic assemblage adds core struck blades, while in the subsequent Mesolithic, geometric microliths form an important part of the inventory (Runnels 1995, pp. 708–726; Runnels et al. 2005, pp. 268–277). Blade production became more efficient, with thinner pieces, from the Neolithic into the Bronze Age (Runnels 1985, pp. 388–391; Perlès 1990a, pp. 202–229; Kardulias 1992, pp. 427–432). Runnels (1982) notes the manufacture and use of blades, bladelets, and flakes in the Geometric, Archaic, and Classical periods. While currently the archaeological evidence for the use of stone tools in the Roman period is limited, the descriptions of threshing sledges by Roman authors suggests considerable use of chert for this purpose (Kardulias and Yerkes 1996, pp. 658–660). Local artisans throughout the Balkans produced stone implements for use in sledges and as gun flints and strike-a-lights into the 19th and 20th centuries (Evans 1887; Fox 1985).

elicit more precise contextual associations of lithic artifacts than have been recognized in the past and to demonstrate the possible continuity of lithic technology into historical periods.[7] The present report has several distinct sections. First, I present the theoretical perspective that guides the work. I then offer a brief description of the site of Isthmia. This is followed by the analysis of the Isthmia flaked stone, with subsections on methods of lithic analysis, the typology of forms, and a catalogue of important specimens. I then consider the spatial distribution of the Isthmia lithics, the broader evidence for the use of lithics in historical periods in Greece, the functions of stone tools at Isthmia, the acquisition of raw materials, and the evidence for craft specialization. The analysis reveals the continued production and recycling of stone tools in historical times, their circulation through local and regional exchange systems, and the use of stone tools in a variety of activities including basic agricultural tasks, craft production, and perhaps ritual.

THEORETICAL PERSPECTIVE

Are there economic and sociopolitical factors common to prehistoric and historical periods in the Aegean that might explain the continued use of "primitive" lithic technology over several millennia? To address this central problem, I consider economic models, especially those concerned with the notion of efficiency. While I do not discount the symbolic significance of lithics,[8] their primary purpose and value is utilitarian. Two theoretical approaches, cultural materialism and formalist economics, are particularly useful in interpreting the ongoing importance of stone tools.

In the cultural materialist model, societies are analyzed in terms of the concepts of infrastructure or economic base, structure, and superstructure. The production and distribution of stone tools are part of the structure, or the economic and political activities by which every society forms groups to allocate, regulate, and exchange labor and goods.[9] Embedded in the structure are the relations of production, that is, the actions by which people organize the manufacture and dispersal of items. Specialization by certain artisans is one expression of these relations. The use of lithics falls primarily within the infrastructure, specifically subsistence practices (projectile points for hunting, sickle elements for reaping of grains, knives for cutting meat), but it also involves the structure when such tools are employed in craft activities.

Ideas from anthropological economics complement the cultural materialist framework. The formalist school of thought argues that humans choose from an array of options to maximize benefits and minimize costs.[10] Members of the substantivist school argue that the formalists impose a capitalist bias on non-Western societies, and they stress instead the embeddedness of the economic system in each unique culture as a whole.[11] Leaving the polemics of each camp aside, I adopt a formalist approach in this study because it provides a comparative tool with which to assess the actions of people separated by geographical, cultural, and temporal boundaries.

7. For Halieis, see Runnels 1982, pp. 366–369; Pullen 2000, pp. 170–180.
8. See, e.g., Carter 1994.
9. Harris 1968, pp. 4, 659; 1979, pp. 53–54, 70–75.
10. LeClair 1962; Cook 1966.
11. Polanyi 1957; Dalton 1961.

Runnels used a formalist approach in his analysis of millstone production and trade in the Aegean.[12] His work stands as one of the first and best examples of the explicit use of a theoretical model in the study of stone tools in Greece. Runnels demonstrated that the production and distribution of millstones followed predictable patterns based on rational choices made by past peoples. He considered the costs of production and transport to explain the distribution of millstones in the Argolid and Saronic Gulf region. Underlying the analysis is a pragmatic foundation: "The changes in the frequencies of shapes, or the shifts from local to distant sources of raw materials in the prehistoric and historical periods prove that millstones were not fixed, unchanging and long-lived forms handed down from generation to generation. On the contrary, they sometimes changed as need, uses and circumstances were altered."[13]

My interpretation of flaked stone tools is similar. If such items appear in a variety of contexts at Isthmia (and other sites), then we must conclude that the implements had real, practical value. Furthermore, despite the seemingly unchanging nature of the assemblages, there are variations in the types of tools represented. Unlike the millstones, however, the general shapes did not change radically, primarily because while the form of millstones necessarily evolved from ovate to circular as the grinding practices shifted from reciprocal to rotary motion, the basic action of flaked stone tools remained essentially unchanged. Flaked lithics may have retained similar functions (e.g., as cutting tools) over long periods, but the materials that they were used to work and the contexts in which they were used may have been quite different at various times.

THE SITE

The Sanctuary of Poseidon at Isthmia (Fig. 1), situated at the southeastern corner of the Isthmus of Corinth, commands the major land route between central and southern Greece. Due to its location, the sanctuary enjoyed an international reputation in antiquity as one of the four major Panhellenic religious centers. The site and its environs have been investigated since the 19th century.[14]

Since Broneer's initial investigations at the site in 1952, there has been a debate about the significance of the prehistoric component. Broneer suggested that several fragments of large walls were remnants of a trans-Isthmian defensive fortification,[15] but later evidence has demonstrated that interpretation to be incorrect.[16] The substantial quantity of Late Helladic (LH) pottery at the site suggests a Mycenaean presence, but both Broneer and Morgan argue that the use of the site in the Late Bronze Age was sporadic at best.[17] Recently, however, an Early Mycenaean house was discovered west of the Temple of Poseidon, with some indication of other structures from the same time period in the vicinity.[18]

Isthmia enjoyed considerable importance in the Early Archaic period when the Temple of Poseidon was built (690–650 B.C.) and in the mid-6th century when the sanctuary attained Panhellenic status.[19] The site prospered throughout the Classical and Hellenistic periods but declined after the sack

12. Runnels 1981, 1985.

13. Runnels 1981, p. 208.

14. Leake 1830; Monceaux 1884; Broneer 1953, 1955, 1958, 1959, 1962, 1966; Clement 1968, 1970, 1974, 1976; *Isthmia* I, II, V; Gebhard 1973, 1993a, 2001, 2002a; Rostoker and Gebhard 1980, 1981a, 1981b; Rostoker, McNallan, and Gebhard 1983; Gebhard and Hemans 1992, 1998; Gregory 1995; Anderson-Stojanović 1996; Gebhard, Hemans, and Hayes 1998.

15. Broneer 1959, p. 300.

16. *Isthmia* V, pp. 4–5; *Isthmia* VIII, pp. 437–438.

17. *Isthmia* II, p. 6; *Isthmia* VIII, p. 305.

18. Balomenou and Tassinos 2007.

19. Gebhard 2002b.

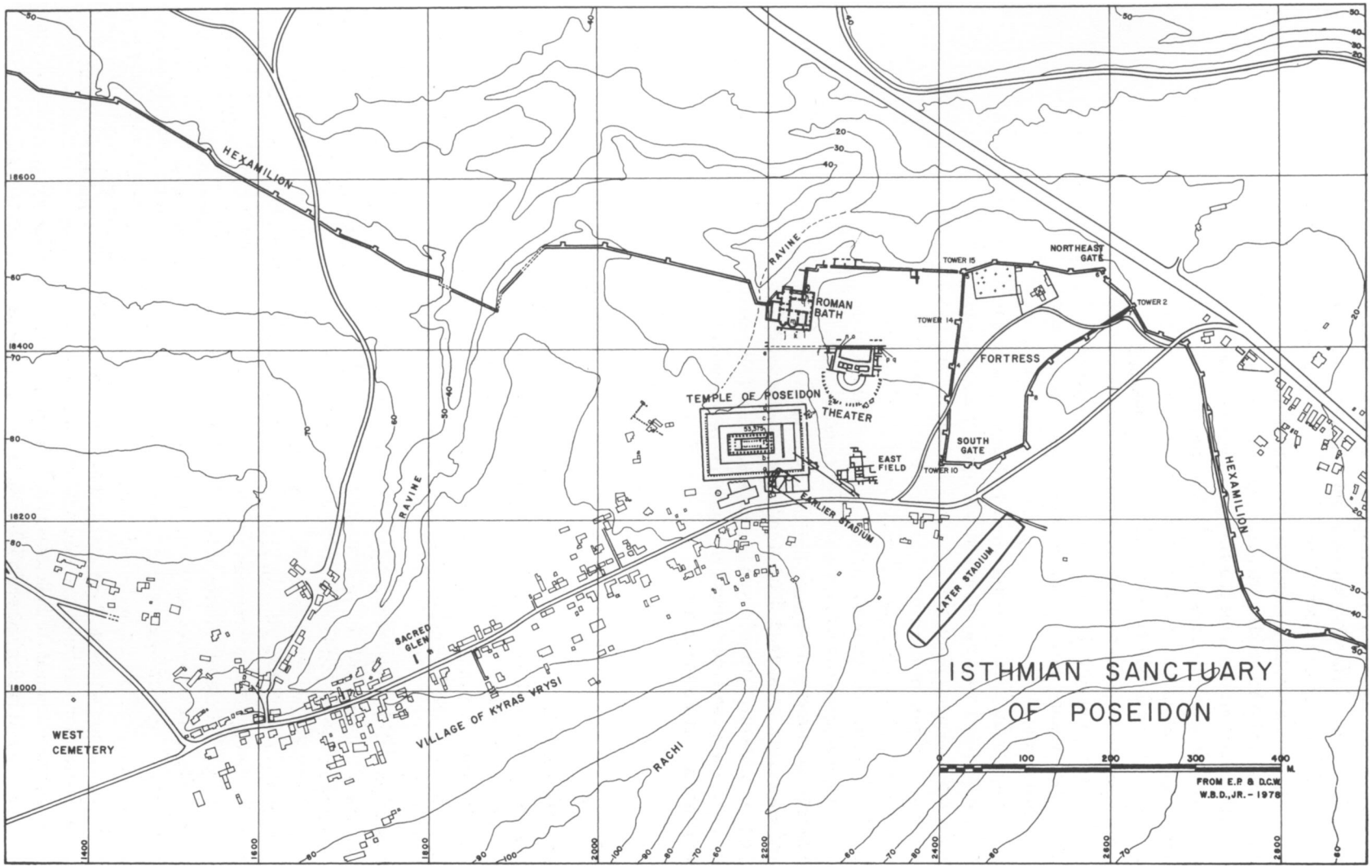

Figure 1. Plan of the Sanctuary of Poseidon at Isthmia

of Corinth in 146 B.C. About two centuries later the sanctuary enjoyed a major revival and renovation under the direction of the Roman colony of Corinth in the Early Empire.[20]

The predominantly ceremonial character of Isthmia changed in the 4th and 5th centuries A.D. The construction of the Hexamilion across the Isthmus of Corinth was an effort to block invading barbarian groups.[21] A large fortress just east of the Sanctuary of Poseidon housed a major garrison.[22] Military engineers dismantled the ancient buildings in the sanctuary and used the blocks in the fortifications[23] as part of an empire-wide strategy of containment.[24] Over the succeeding centuries, the Fortress and Hexamilion were occasionally refurbished in order to meet various military threats.[25] These events affected all aspects of the site, from monumental architecture to portable artifacts, but people continued to occupy the area in most periods.[26] The stone tools that have been recovered indicate a certain level of continuity in objects associated with the mundane tasks of daily life and with activities at the sanctuary.

Archaeological Contexts

The flaked stone assemblage discussed in the present study derives from a number of loci (primarily excavation units, but also some surface survey contexts) at and around Isthmia. These components are described briefly below in order to provide chronological contexts for the lithics. There are a number of primary areas, several of which have further specific sections within them. Detailed descriptions of the deposits can be found in various reports.[27]

The Sanctuary

The Temple of Poseidon and Adjoining Areas

The Archaic temple and its associated altar were built on a natural plateau bounded on the west by a ravine running northeast to southwest and on the east by a shallower gully. Construction occurred between 690 and 650 B.C., with modifications in the 6th century. Following a catastrophic fire ca. 450 B.C., a Classical temple was erected on the same site. The temple underwent major renovations near the end of the 4th century and substantial reconstruction in the late 1st century A.D.[28] The preparation of the plateau for the original temple and the subsequent modifications and expansions involved the movement of soils that created some of the mixed deposits containing historical and prehistoric material, including flaked stone implements. After the fire of ca. 450 B.C. debris gradually filled the northwest ravine and areas at the northern periphery of the plateau. Subsequent

20. Gebhard 1993b.

21. Procop. *Aed.* 4.2.1–28, trans. H. B. Dewing, Cambridge, Mass., 1961; Beaton and Clement 1976; Clement 1975, 1976; *Isthmia* V.

22. Gregory and Kardulias 1990; Kardulias 2005.

23. *Isthmia* I, p. 2.

24. Daly 1942; Cheetham 1981, pp. 15–16.

25. *Isthmia* V, pp. 141–151.

26. *Isthmia* IX.

27. Smith 1955; *Isthmia* I, VIII; Gebhard 1973; for information on deposits from the 1989 excavations, see also Gebhard and Hemans 1992, 1998; Anderson-Stojanović 1996; Gebhard, Hemans, and Hayes 1998.

28. Gebhard and Hemans 1992, p. 39; 1998, p. 6; Gebhard, Hemans, and Hayes 1998, pp. 416–417, 433–434.

layers were added in the 4th century B.C. and 2nd century A.D. in order to enlarge the temenos. The terracing known in early excavation records as the "North and Northwest Temenos Dump" fills contained a substantial number of lithics. A second concentration of flaked stone came from apparently disturbed prehistoric burials at the north edge of the northwest ravine.[29] The temple was dismantled in the early 5th century A.D. and later, and many of its blocks were used as spolia in the Hexamilion.

The Theater

The initial structure northeast of the Temple of Poseidon dates to the end of the 5th century B.C.; it was extensively remodeled in the 4th century. At the beginning of the Roman period the old theater underwent additional remodeling and was then extensively rebuilt in the 2nd century.[30] In a cave that was carved out of the clay substratum beneath the bedrock at the top of the Roman cavea, dining (perhaps ritual in nature) took place in the Classical period, but ceased by the end of the 4th century B.C. Prehistoric material from the area includes Bronze Age sherds from a gully at the north end of the scene building. Topographic studies have revealed the presence of a streambed running northeast from the Rachi through the Theater. The Early Stadium covered the upper section.[31] Prehistoric ceramics and associated materials, including some obsidian, may have washed down into the gully from the higher ground to the south. Like the temple, the Theater was also denuded of usable stone in the 5th century A.D.

The Palaimonion

A small precinct dedicated to Melikertes/Palaimon situated immediately southeast of the temple has been dated to the second half of the 1st century A.D. (ca. A.D. 60), with additional construction taking place there in the next century.[32] The deposits associated with the several pits and structural remains are all Roman in date, with occasional Bronze Age, Early Iron Age, Archaic, Classical, and Hellenistic sherds.[33]

Large Circular Pit

Located 43 m southwest of the temple, this feature was a well or cistern measuring 5 m in diameter and 19.75 m in depth. Gebhard and Reese suggest that ceremonial feasting occurred near the pit in the Archaic period.[34] The ceramics, most of which can be associated with food and drink preparation and consumption, indicate that the feature was filled at the end of the 5th century B.C. Some earlier material from the 7th and first half of the 6th century was also found in the assemblage. The faunal material includes bones of ovicaprids, cattle, and pigs, many with cut marks from butchering. Risser and Gebhard note that the pit contained "a mixture of fills that had been collected from the temple site and the temenos."[35]

29. Smith 1955, p. 143.
30. Gebhard 1973, pp. 63, 89.
31. *Isthmia* VIII, pp. 4–5.
32. *Isthmia* II; Gebhard, Hemans, and Hayes 1998, pp. 431, 436, 439.
33. Gebhard, Hemans, and Hayes 1998, pp. 431–433; for the Bronze Age and Early Iron Age, see *Isthmia* VIII, pp. 435–447, 450–466.
34. Gebhard and Reese 2005, p. 126.
35. Risser and Gebhard, forthcoming.

Areas outside the Sanctuary

The Rachi Settlement

Excavation of the substantial community on the high ridge ca. 200 m south of the sanctuary revealed a number of houses and a shrine probably dedicated to Demeter and Kore that may date to the Archaic period.[36] The foundations of the buildings were carved out of or set on the bedrock during the primary occupation in the Hellenistic period, so there are no prehistoric structures on the excavated part of the ridge; the settlement dates from the middle of the 4th to the end of the 3rd century.[37] Anderson-Stojanović notes that there are in general two types of deposits at the Rachi, destruction and surface. She believes that the lithics from this area cannot be linked to any use level of the settlement. Prehistoric, Early Iron Age, and Archaic ceramics occurred in some fills, showing a human presence predating the settlement in the area.[38]

The East Field

The area known as the East Field is located 50 m east of the Temple of Poseidon. First uncovered in the 1970s, it has only recently become the subject of more intensive investigation. The East Field contains a series of walls that seem to be from small buildings, possibly residences or public accommodations for houseguests and athletes.[39] The vast majority of the ceramics from the area are Roman, dating primarily to the 3rd and 4th centuries, but with some earlier and later material (Classical and Early Byzantine, respectively). Beaton and Clement suggest that the termination of occupation in the East Field and the demise of the sanctuary as a whole occurred at the end of the 4th century as a consequence of Alaric's raid.[40]

The West Cemetery

A large burial ground lies about 600 m west-southwest of the sanctuary at the west end of the village of Kyras Vrysi. Although many of the 138 excavated graves lacked human remains, we can assume that at least 138 individuals were present. The associated pottery dates primarily to Archaic and Classical times (6th to 5th centuries B.C.).[41] No other use or occupation is noted for this area, but the modern road (and presumably the ancient one) between Corinth and Isthmia bisects the cemetery.

The Fortress

The enceinte encloses an area of 2.71 ha located 200 m east of the temple. Built to accompany the Hexamilion in the first quarter of the 5th century A.D., the area contained several Early Roman houses.[42] Intensive surface survey in the interior of the Fortress revealed the presence of small quantities of Classical and Hellenistic ceramics, but the overwhelming majority

36. Anderson-Stojanović 1996, p. 62.

37. Anderson-Stojanović 1996, p. 63.

38. *Isthmia* VIII, pp. 435–436; Anderson-Stojanović 2002.

39. Marty 1993, p. 123.

40. Beaton and Clement 1976.

41. Clement and Thorne 1974; Dickey 1992, pp. A106–A124; Rife and Giesen 1994.

42. *Isthmia* V, pp. 2–3; also Jenkins and Megaw 1931–1932, pp. 79–81.

of the pottery is Early Roman, Late Roman, and Byzantine in date; no prehistoric material was found.[43] Leveling of the interior after construction of the fortifications resulted in the lateral movement of substantial amounts of soil, but probably not from any great distance.

Kromna

Originally identified by Wiseman, the site of Kromna lies 4 km west of the sanctuary along the ancient road to Corinth.[44] The Eastern Korinthia Archaeological Survey (EKAS) recorded dense artifact concentrations over an extensive area along with several features including tombs and wall fragments.[45] The material falls into a wide span from Archaic to Late Roman (ca. 700 B.C.–A.D. 700). Although the stone tools from Kromna were found some distance from the sanctuary and other areas mentioned in this report, they are discussed in the present study because they were collected as part of the effort to link Isthmia to the surrounding area.

Soils

Many of the project notebooks, particularly those from the Broneer excavations in the area of the sanctuary proper, describe a reddish soil as the matrix in which the prehistoric and Geometric pottery and many lithics were found.[46] Hayward describes this soil as a *caliche,* a product of the weathering of the marl and conglomerate bedrock found beneath the sanctuary.[47] Around the sanctuary, lithics appeared in red soils/caliche in the Northwest Temenos Dump trench, the Theater, the East Temenos,[48] and the Southeast Area. The considerable building and renovation activity in the sanctuary in historical times led to the mixing of early and later artifacts in many of these areas,[49] thus complicating the effort to determine the chronological contexts of many lithics.

The description of the soil cover in the East Field notebooks corresponds fairly closely with that for the central part of the sanctuary. Excavators observed a reddish soil and a light brown soil with numerous small rocks. Most of the buildings in this area were built on the marl substrate.

Excavation in the vicinity of the Fortress in the 1930s showed that the eastern edge of the area had Roman structures built into the soft marl bedrock prior to the construction of the fortifications. After the Fortress was built in the early 5th century, fill dirt was placed all along this eastern line to bring it to the same level as the rest of the interior.[50] The result was a mixing of soils from different parts of the sanctuary area.

The Rachi lacks complex stratigraphy since only a thin mantle of soil covers the bedrock upon which the ancient structures were built. Within these buildings, floors had earthen packing, covered with several layers of destruction debris.[51] As noted earlier, the linkage between the lithics on the Rachi and particular use levels of the Hellenistic site is problematic.[52]

43. Gregory and Kardulias 1990, pp. 488–495; Kardulias 2005, pp. 72–82.

44. Wiseman 1978, pp. 64–66.

45. Caraher, Nakassis, and Pettegrew 2006, pp. 14–21; Tartaron et al. 2006, pp. 494–501.

46. See *Isthmia* I, pp. 4–5.

47. Hayward 1999, p. 4.

48. Terrace 1 in Gebhard and Hemans 1992.

49. *Isthmia* VIII, p. 19.

50. For discussion, see Jenkins and Megaw 1931–1932, pp. 79–81.

51. E.g., a hard gray earth shown in Anderson-Stojanović 1996, p. 76, fig. 12.

52. V. Anderson-Stojanović (pers. comm.).

FLAKED STONE IMPLEMENTS

The University of Chicago and the UCLA/OSU excavations yielded a total of 149 pieces of flaked stone, of which 140 were available for analysis. With the exception of 11 chert artifacts, one of an unidentified siliceous material, and one of an unknown material (discarded in the field), the material in the assemblage consists of high-quality obsidian, the appearance of which clearly suggests a Melian origin (Table 1). A Melian source is further supported by a comparison of the Isthmia lithics with a sample of Melian obsidian collected by Broneer and curated at the Isthmia Museum. The obsidian is very dark gray to black in color (Munsell 2.5/N-Gley), with occasional lighter streaks or bands visible in the matrix. Surfaces are often dull or matte in appearance, probably due to extended exposure after initial fracturing and further abrasion in the soil.

Field retrieval methods may have significantly affected the sample of lithics available for examination. In the initial campaigns of the 1950s and most of those that followed, fieldworkers screened excavated soil only in special situations (e.g., Broneer's work at the Temple of Poseidon). Only the 1980 and 1989 excavations had a policy of total retrieval.[53] It is quite likely, therefore, that many small stone flakes were not detected in the early excavations. Even so, Broneer recovered 108 of the 149 pieces in the sample during his work in 1952–1967. The remaining material derives from the later work of the Chicago (20 pieces) and UCLA/OSU (21 pieces) excavations.

Moreover, while excavators collected most of the worked flakes that they encountered, some were not saved. Entries in several UCLA notebooks indicate that nine pieces of flaked stone were discarded in the field. Other than their material, general shape, and archaeological context, little else is known about these items. Overall, the early collection of flaked stone was haphazard, as has often been the case at historical sites in the Aegean. Yet even though the assemblage under study is not a complete and perhaps not even a representative sample of the lithics produced and utilized at Isthmia, it still helps to elucidate the extent of flaked stone tool use in historical periods and the extent to which lithic production entailed craft specialization.

One can draw several important inferences concerning craft specialization from the extant flaked stone assemblage. The evidence indicates some degree of specialization in the production of blades. The abundance of a particular type of blank reflects purposeful manipulation of cores. The small number of cores, crested blades, and primary flakes at the site suggests the existence of specialized activity loci.[54] Some preliminary reduction occurred at the site, but the majority of this activity may have taken place elsewhere, as mostly tool blanks or finished blades were brought to the area. Limited functional analysis of the material reveals little evidence for use in specialized activities; for the most part the tools were used in generalized activities associated with agricultural and domestic tasks.

53. For the 1989 season, see Gebhard and Hemans 1992, p. 2.

54. For a glossary of lithic terms, see Brezillon 1968; Crabtree 1972; Kardulias 1992.

TABLE 1. FLAKED STONE ASSEMBLAGE BY BLANK AND MATERIAL

	Material							
	Obsidian		*Chert*		*Other/Unknown*		*Total*	
Blank	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Not discernible	7	4.7	0	0	1	0.7	8	5.4
Flake core	1	0.7	1	0.7	0	0	2	1.3
Blade core	5	3.4	0	0	0	0	5	3.4
Primary cortical flake	5	3.4	0	0	0	0	5	3.4
Secondary cortical flake	7	4.7	5	3.4	0	0	12	8.1
Secondary noncortical flake	19	12.8	4	2.7	1	0.7	24	16.1
Tertiary noncortical flake	5	3.4	0	0	0	0	5	3.4
Proximal blade segment	35	23.5	0	0	0	0	35	23.5
Medial blade segment	40	26.8	1	0.7	0	0	41	27.5
Distal blade segment	7	4.7	0	0	0	0	7	4.7
Complete blade	4	2.7	0	0	0	0	4	2.7
Crested blade	1	0.7	0	0	0	0	1	0.7
Total	136	91.3	11	7.4	2	1.3	149	100

Analytical Methods

The morphological classification of the Isthmia lithics began with the assignment of each piece to one of 12 possible blank types: (1) flake core, (2) blade core, (3) primary decortication flake, (4) secondary decortication flake, (5) secondary noncortical flake, (6) tertiary noncortical flake, (7) proximal segment of a blade, (8) medial segment of a blade, (9) distal segment of a blade, (10) complete blade, (11) crested blade, and (12) debris. The characteristics of each category are described below in the section on formal typology.

Subsequently, each specimen was examined macroscopically with a 10× hand lens to determine the extent and nature of any retouch, which is defined as the purposeful modification of the edges in order to produce a desired shape. Minimally, the identification of retouch requires three adjacent flake scars oriented in the same direction. Knappers at Isthmia used both percussion and pressure techniques to retouch flakes and blades. Retouched specimens received labels (e.g., scraper) that, although functional in nature, carry no particular use implication; the terms are archaeological conventions that do not necessarily indicate actual past usage. The basic terminology in this typology (both for blanks and retouched pieces) derives from several standard texts on lithic analysis.[55] Finally, each artifact was measured and weighed to provide a metrical base of comparison.[56] The typological and metrical analyses took place in the Isthmia Museum. All information from the data sheets was transposed into a numeric code for analysis by SPSS, initially on the VAX mainframe computer at Kenyon College and then on a personal computer.

Microwear analysis was also undertaken as part of the study. Semenov pioneered the determination of lithic tool function through the use of low-power microscopy.[57] Although this method has proved to be effective in identifying many types of wear, some subtle traces of use evade detection.[58] The high-power technique (lens strength 50×–500×) uses incident light to discern less distinct evidence, which includes a variety of polishes,

55. Movius et al. 1968; Brezillon 1968; Bordaz 1970; Crabtree 1972; Whittaker 1994; Andrefsky 1998.

56. See Runnels 1985 for standard methods of measurement.

57. Semenov 1964.

58. See Tringham et al. 1974; Odell and Odell-Vereecken 1980.

striations, and micro-damage or alteration of edges peculiar to particular functions.[59]

Several of the Isthmia pieces were examined using the low-power binocular microscope in the Isthmia Museum. Because of its brittle nature and susceptibility to postdepositional scratching, obsidian is a poor candidate for such analysis. It was not possible to discern any functional landmarks on any of the obsidian pieces. One chert artifact (**11**, see Fig. 2) has substantial gloss on both lateral margins (one retouched into a serrated cutting edge and the other unmodified) that indicates it was used to cut plant stems, probably as part of a sickle.

Formal Typology

The discussion of types below, organized into the categories of cores and flakes, blades, and retouched lithics, reflects the technology of the reduction sequence. The various types of blanks are listed and described in the order in which they would appear during production. The tools receive separate and more detailed treatment because these items, along with blades, represent the ultimate products toward which the knappers worked. The various categories of blanks and tools reflect production decisions made by the stone workers. Quantitative analyses of the blanks and tool types and the materials from which they were made may be found in Tables 1 and 2. Examples of specific types are illustrated in Figures 2–4; boldface numbers refer to descriptions in the catalogue below.

Cores and Flakes

Two specimens, one of obsidian (**21**) and one of chert, are percussion *flake cores* or core fragments with angular outlines that represent irregular, unsystematic working. Flake scars indicate several directions of removal, and platform preparation is minimal.

Five *blade cores* (e.g., **9**, **16**) were found. All specimens are obsidian. Three nearly complete pieces are prismatic cores that preserve faceted platforms; of the incomplete specimens, one is a medial segment and the other the bottom or distal end of prismatic cores. All specimens exhibit highly standardized production methods, with a series of parallel blade scars covering more than half the surface of the cores. The scars clearly indicate that blades of varying widths were removed from the same core.

Five *primary cortical flakes* were identified. All specimens are obsidian. Included in this category is any flake with cortex covering more than 50% of the dorsal surface. The cortex on obsidian is a rough, weathered surface.

There are 12 *secondary cortical flakes* (e.g., **4**), defined as any flake with cortex covering less than 50% of the dorsal surface. These flakes are generally smaller than those that are classified as primary. Seven of the examples are obsidian and five are chert.

There are 24 *secondary noncortical flakes* (e.g., **18**). Flakes in this group lack cortex and have a maximum dimension of at least 1.75 cm. These flakes represent secondary trimming of a core and often provide blanks for ad hoc and retouched tools. Nineteen specimens are obsidian, four are chert, and one is an unidentified material.

59. Keeley 1980; Vaughan 1985.

TABLE 2. STONE TOOLS BY BLANK, TOOL TYPE, AND MATERIAL

Blank	*No Retouch*			*Scaled Piece*			*Truncated Blade*			*Side Scraper with Retouch*			*Point/ Arrowhead*			*End Scraper*			*Notched Piece*			*Retouch Piece, Unifacial*			*Piercing/ Incising Tool*			*Sickle Element with Gloss*			*Retouch Piece, Bifacial*			*Subtotal*			*Total*
	ob	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	*ob*	*c*	*o*	
Not discernible	7	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–	1	8
Flake core	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	2
Blade core	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	5
Primary cortical flake	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	5
Secondary cortical flake	7	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	7	5	–	12
Secondary noncortical flake	14	3	1	–	–	–	–	–	–	–	1	–	2	–	–	1	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	19	4	1	24
Tertiary noncortical flake	5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	5
Proximal blade segment	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	3	–	–	–	–	–	–	–	–	1	–	–	35	–	–	35
Medial blade segment	36	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	1	–	–	–	–	40	1	–	41
Distal blade segment	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–	–	7
Complete blade	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	4	–	–	4
Crested blade	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Total	121	7	2	1	–	–	1	–	–	–	1	–	2	–	–	1	1	–	2	–	–	4	1	–	3	–	–	–	1	–	1	–	–	136	11	2	149

Abbreviations: ob = obsidian, c = chert, o = other.

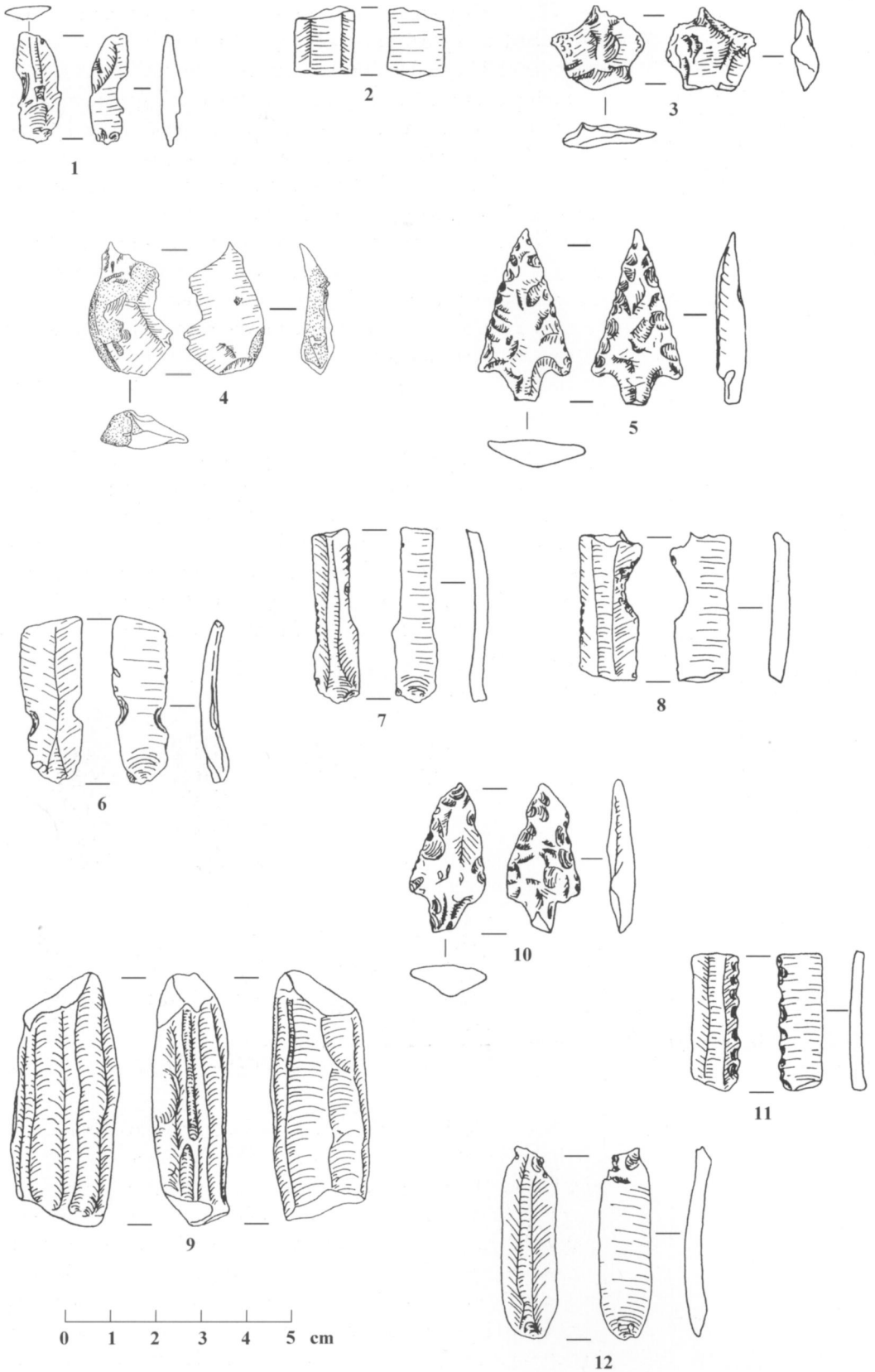
1
2
3
4
5
6
7
8
9
10
11
12
0 1 2 3 4 5 cm

Figure 2 *(opposite)*. Lithics from Isthmia (obsidian unless noted otherwise): scaled piece on blade 1, truncated blade 2, pointed tool 3, secondary cortical flake 4, contracting stem projectile point 5, notch on blade 6, retouched blade 7, notch on truncated blade 8, prismatic blade core 9, contracting stem projectile point 10, sickle element on chert blade 11, nearly complete, unretouched proximal blade segment 12. Drawings M. Huijsing

Five *tertiary noncortical flakes* are present in the sample. This group is comprised of any flake devoid of cortex and with a maximum dimension less than 1.75 cm. These pieces represent both final core reduction and trimming of larger flakes in tool production. All specimens are obsidian.

One *crested blade* (**15**) was found. The specimen is obsidian. Since crested blades are direct products of the reduction sequence leading to the creation of blade cores,[60] they are technically core preparation fragments. Crested blades have unique landmarks, however, and they can be utilized or retouched to serve other purposes. Typically, crested blades exhibit triangular cross-sections and a series of flake scars with an axis perpendicular to the central arris on the dorsal surface. These blades are the first to be detached from a core and their removal leaves behind smooth facets for subsequent prismatic blades.

Blades

The Isthmia lithic sample contains a total of 87 blades (Fig. 3). A blade is defined as an elongated flake with a length at least twice its width, parallel lateral margins, and one or more dorsal ridges parallel to those margins. With the exception of one chert medial segment, all the specimens are obsidian. Blade production requires the preparation of a specialized tabular or prismatic core that yields highly symmetrical, regular blanks. Blades can be used without further modification or can be retouched to make a variety of tools.

Figure 3. Obsidian blade fragments. Photo M. Bootsman

The production of blades is a consistent feature of flaked stone technology in the Bronze Age throughout the Mediterranean region and the Near East.[61] In an experiment, Sheets and Muto required two and a half hours to produce 83 blades from a polyhedral core.[62] While the example of Sheets and Muto's work represents an ideal situation in which the core was worked around its entire perimeter to exhaustion (unlike the majority of Aegean blade cores, which are tabular and have an unworked back), their experiment gives us some measure of productivity. Even if we reduce by half the number of blades that can be derived from a core, all of the Isthmia blades could have been produced in several episodes of work.

60. Bordaz 1970, p. 51; Crabtree 1972, p. 72.

61. Kardulias 2003; Rosen 1997.

62. Sheets and Muto 1972.

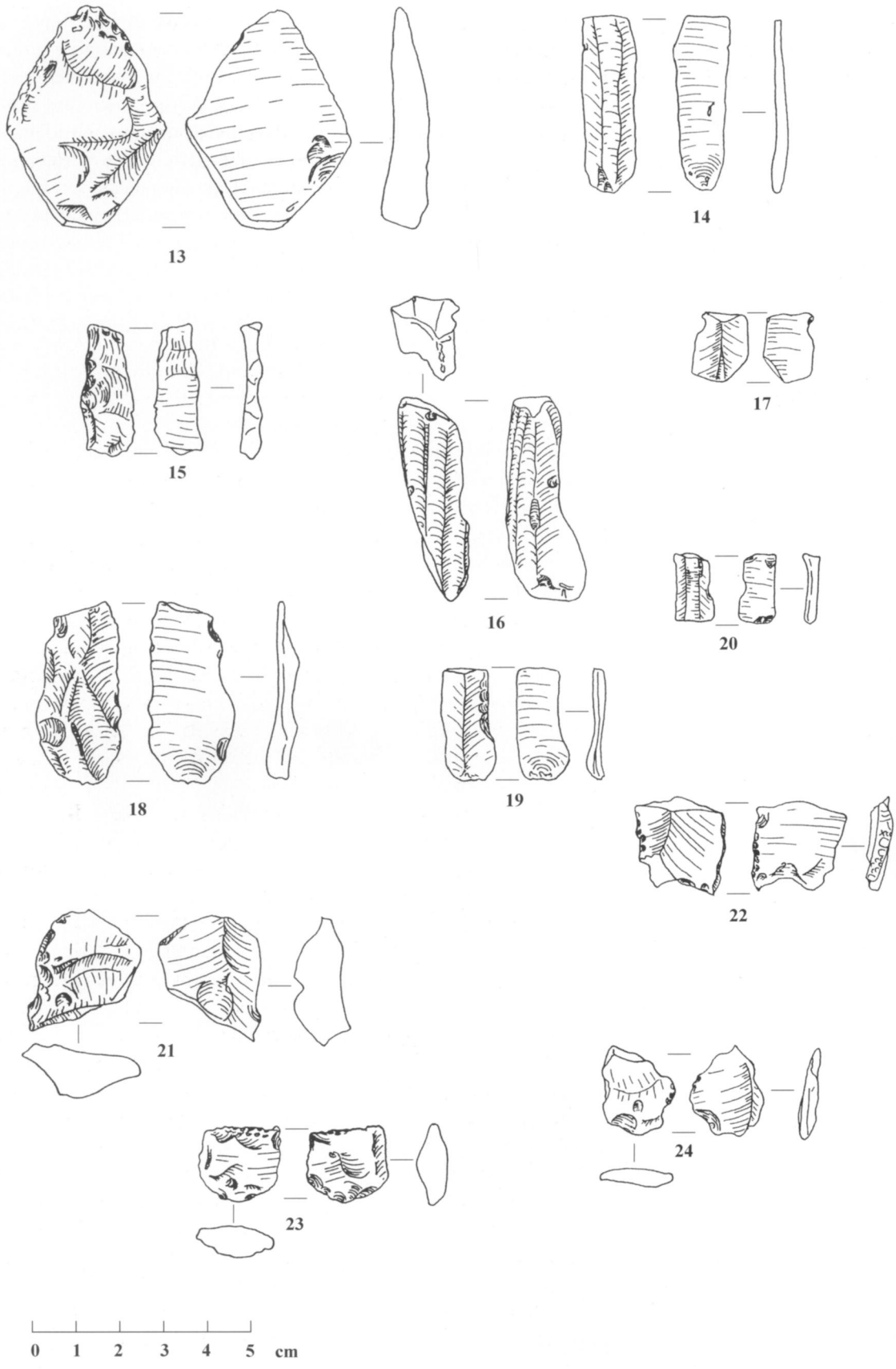
13
14
15
16
17
18
19
20
22
21
23
24
0 1 2 3 4 5 cm

Figure 4 *(opposite)*. **Lithics from Isthmia (obsidian unless noted otherwise): chert end scraper 13, proximal blade segment 14, crested blade 15, prismatic blade core fragment 16, pointed tool 17, chert secondary noncortical flake 18, utilized proximal blade segment 19, retouched blade 20, flake core fragment 21, chert side scraper 22, pointed tool 23, distal end scraper 24.** Drawings M. Huijsing

Within the category of blades, there are four complete examples. A total of 35 proximal blade segments (e.g., **12, 14, 19**), a category that includes any blade fragment retaining the striking platform and/or the bulb of percussion, were found. There are 41 medial blade segments, or specimens that lack both the striking platform and the opposite (distal) end of the blade. Seven specimens may be classed as distal blade segments, which are the tips or ends of blades with a typically slightly rounded facet.

Retouched Lithics

Nineteen examples of retouched lithics occur. This category includes any piece that receives secondary treatment after its removal from a core in order to shape the outline. The retouch modifies the natural edge(s) and lends the piece a distinct morphology, which has traditionally been the basis for classifying tools. Even though some of the category labels imply specific functions, various studies demonstrate that the putative uses often do not stand up to rigorous microwear examination.[63] Therefore, the types listed below must be viewed as categories based exclusively on morphological attributes. These artifacts may or may not have been used, but they differ from the unmodified blanks described above. Most of the category labels are familiar to archaeologists and as such are important as heuristic devices.

One denticulated sickle element (**11**) is present. The specimen is a chert medial blade segment with alternating retouch on the right side. Sickle elements are typically elongated blanks that exhibit retouch. The intent of the retouch is twofold: (1) to give the piece a rectangular to subrectangular outline, usually through truncation, and (2) to create a serrated edge that is more effective in cutting plant stems than a straight margin. When such pieces have been used, as was the case with this piece, they acquire a polish or sheen that is visible to the naked eye.

There are two contracting stem projectile points (**5, 10**). Based on their size and configuration, these two obsidian points are arrowheads. They exhibit symmetrical triangular outlines with basal stems or tangs for hafting to wooden shafts. This shape was common in the Early Bronze Age.[64]

Two examples of notches (**6, 8**) are present. Both specimens are obsidian blade segments, one proximal and the other medial. These tools have concave indentations along one or more margins and were probably used to work rounded surfaces of wood or bone.

Three pointed pieces (**3, 17, 23**) are all made of obsidian. Such implements, also referred to as perçoirs or piercing/incising tools, possess a pointed facet, typically at one end but occasionally on a lateral margin. Depending on the stoutness of the tip, the tools could have been used to incise hard or soft materials. Two specimens were formed on secondary noncortical flakes, and one was made on a medial blade segment. Each piece has a distinct tip or point formed by small, marginal, converging direct and inverse retouch. The point typically exhibits some rounding, presumably from use.

Three tools may be identified as scrapers (**13, 22, 24**). Scrapers typically have steep working facets on a side or end. The edge is shaped by abrupt continuous retouch that forms a series of parallel to subparallel flake scars. These tools can work materials with hardness varying from soft

63. E.g., Yerkes 1987, pp. 128–134; Bamforth, Burns, and Woodman 1990; Young and Bamforth 1990.

64. Runnels 1985, p. 388.

(hide) to hard (wood, bone, stone). Two of the examples from Isthmia are end scrapers (one obsidian, one chert), and the other, made from chert, is a side scraper.

One tool may be classified as a truncated piece (**2**). The specimen is an obsidian medial blade segment. Deliberate shortening of one or both ends of a blank permits it to fit into a handle or haft as part of a composite tool. Truncation became a common technique of tool production in the Mesolithic, but the practice also continued in the Neolithic and Bronze Age and perhaps later.

There are six pieces that exhibit some retouch, but which do not fit any of the previous classes (e.g., **7**, **20**). Four obsidian blades and one chert secondary cortical flake exhibit unifacial retouch, and one obsidian blade has scattered bifacial retouch.

One specimen may be categorized as a scaled piece (**1**). The specimen is a medial obsidian blade segment. Scaled pieces exhibit extensive shallow scalar retouch that converges from opposing ends on both surfaces. Some scholars argue that such pieces served as wedges; Runnels argues that the unusual retouch pattern may be the result of use as a strike-a-light.[65]

Catalogue

Key specimens of the lithics discussed above are catalogued here.[66]

1 Scaled piece Fig. 2

IM 131. Lot 58. Trench C6. Temple of Poseidon (Archaic temple destruction debris, mixed with Roman).

Dim. 2.32 × 0.89 × 0.35 cm, weight 0.50 g.

Medial segment of an obsidian blade with trapezoidal cross-section. Shallow converging flake scars on both surfaces. Both lateral margins heavily battered on dorsal and ventral surfaces.

2 Truncated blade Fig. 2

IM 273-1. Lot 184. Northwest Temenos, west-end dump trench (deposit entirely prehistoric).

Dim. 1.44 × 1.13 × 0.29 cm, weight 0.70 g.

Medial obsidian blade segment with trapezoidal cross-section. The specimen has a single truncation formed by steep, direct, irregular retouch to abbreviate purposefully the length of the blank, perhaps so that the piece could be used in a composite tool such as a sickle or reaping knife (no evidence of silica residue or polish, however).

3 Pointed tool Fig. 2

IM 149b. Lots 767/804/806. Trench 1. Theater.

Dim. 1.80 × 1.78 × 0.48 cm, weight 1.20 g.

Nearly complete secondary noncortical obsidian flake. Platform absent. Rough, irregular, bifacial flaking forms a small point on the middle of the distal edge.

4 Secondary cortical flake Fig. 2

IM 149a. Lots 767/804/806. Trench B. Theater.

Dim. 2.95 × 2.0 × 0.68 cm, weight 9.62 g.

Complete obsidian secondary cortical flake. Plain platform. Rough, pitted cortex covers about a third of the dorsal surface and most of the left margin. Direct notch at right medial, but flake scars look fresh.

65. Runnels 1985, p. 374, n. 27.

66. The format of lots, inventory numbers, and trenches in the catalogue and elsewhere in the text varies according to the year of excavation. In the early excavations up to 1980 by the University of Chicago, lots were numbered consecutively, as were inventoried items by material (e.g., IP for Isthmia Pottery, IM for Isthmia Miscellaneous; the latter category included all lithics). After 1980, lots and trenches had a two-digit prefix taken from the last two numbers in the year of excavation (e.g., lot 89-100, from the 1989 excavation). In addition, the UCLA/OSU part of the site used a similar year designator for IM material starting in 1970 (e.g., IM 71-76).

5 Contracting stem/tanged projectile point Fig. 2

IM 2043. Lot 480. Trench MW:14. Mycenaean wall. Context pottery is Mycenaean–Classical. Found with IM 2060, a LH III figurine.

Dim. 3.62 × 2.05 (at barbs) × 0.57 cm, weight 2.8 g.

A complete point made on a secondary noncortical obsidian flake. The specimen has fine covering retouch on both surfaces. The blade edges are straight. Corner notches create shallow barbs and a tang that contracts to a straight base. Exhibits excellent workmanship.

6 Notched piece Fig. 2

IM 2554. Surface. Cavea. Theater.

Dim. 3.40 × 1.34 × 0.38 cm, weight 1.70 g.

Proximal obsidian blade segment with a dihedral platform and triangular cross-section. Left proximal has direct, irregular, small, partial retouch forming a shallow concavity. Right medial has the same retouch, but inverse.

7 Retouched blade Fig. 2

IM 2557. Lot 1592. Trench VII. Theater.

Dim. 3.61 × 0.96 × 0.33 cm, weight 1.3 g.

Nearly complete proximal obsidian blade segment. Plain platform. Left medial exhibits direct, small, irregular utilization. Right medial to distal has direct, small, partial, steep retouch.

8 Notch on truncated blade Fig. 2

IM 2559. Lot 932. Trench 10A. Cave above the Theater. West Kitchen.

Dim. 3.11 × 1.28 × 0.33 cm, weight 1.50 g.

Medial obsidian blade segment with trapezoidal cross-section. Distal end is truncated by direct, large, irregular flaking. Right distal has direct, small, scalar, partial retouch forming a broad, shallow notch.

9 Prismatic obsidian blade core Fig. 2

IM 2560. Surface. Theater buttress 17. Theater.

Dim. 5.27 × 2.25 × 1.96 cm, weight 29.50 g.

Nearly complete, only distal tip missing. Conical outline, multiple cross-section. Heavily faceted platform created by removal of a series of small flakes on proximal end. Preserves nine parallel blade scars varying in width from 0.19 to 0.65 cm. Small patch of cortex on dorsal surface.

10 Contracting stem/tanged projectile point Fig. 2

IM 3110. Lot 2074. Ioannou Well. Location is ca. 48 m from crossroads at the west end of Kyras Vrysi.

Dim. 3.25 × 1.57 (at barbs) × 0.55 cm, weight 2.2 g.

Nearly complete. Formed on a secondary noncortical obsidian flake. Covering bifacial retouch. Straight blade edges lead to rounded shoulders and a mildly contracting stem. The distal tip is missing. Less well made than **5** (IM 2043).

11 Sickle element Fig. 2

IM 3276. Lot 1771. Trench KR-25. Kromna.

Dim. 2.92 × 1.02 × 0.26 cm, weight 0.95 g.

The specimen is made on the medial segment of a chert blade. The right lateral margin has a series of seven teeth and six notches; this serrated edge is formed by small, inverse (toward the dorsal surface), and direct (toward the ventral surface) retouch. In addition, the proximal and distal ends are roughly truncated. Bright polish (sickle sheen) is evident on both surfaces of the denticulated edge.

12 Proximal blade segment Fig. 2

IM 3418. Surface. Court. Theater.
Dim. 4.03 × 1.16 × 0.39 cm, weight 1.95 g.
Nearly complete obsidian blade; proximal segment with a faceted platform and trapezoidal cross-section. Distal tip is missing.

13 End scraper Fig. 4

IM 3324. Trench B-well. Theater.
Dim. 4.81 × 3.55 × 0.69 cm, weight 14.55 g.
Complete secondary cortical chert flake with dihedral platform. Left medial to right medial has direct, small, irregular, low, partial retouch that forms a long scraper facet. Material is dark reddish brown, similar to material from Acrocorinth west slope.

14 Proximal blade segment Fig. 4

IM 3489. Lot 1024. Cave (west wall). Theater.
Dim. 3.9 × 1.15 × 0.27 cm, weight 1.63 g.
Nearly complete obsidian blade; proximal segment with plain platform and trapezoidal cross-section.

15 Crested blade Fig. 4

IM 3491. Lot 2374. Trench IV. Theater.
Dim 2.88 × 1.10 × 0.39 cm, weight 1.45 g.
Medial segment of obsidian blade with asymmetrical triangular cross-section formed by flakes removed from dorsal spine to both lateral margins.

16 Prismatic obsidian blade core Fig. 4

IM 5666. Lot 89-100. Trench 89-17. Southeast Area. Early Stadium.
Dim. 4.46 × 1.52 × 1.16 cm, weight 8.63 g.
Fragment of a blade core. Platform missing. Preserves three blade scars varying in width from 0.45 to 0.63 cm.

17 Pointed tool Fig. 4

IM 5677. Lot 89-169. Trench 15B. Rachi.
Dim. 1.53 × 1.24 × 0.40 cm, weight 0.75 g.
Medial segment of an obsidian blade with trapezoidal cross-section. Direct, irregular, small, marginal, scalar retouch at left distal and along left distal edge converge to form a small blunt point oblique to the left.

18 Secondary noncortical flake Fig. 4

IM 5739. Lot 89-166. Trench 18F. Rachi.
Dim. 4.05 × 1.86 × 0.50 cm, weight 4.25 g.
Nearly complete elongated chert flake with distal tip missing. Plain platform. Numerous dorsal flake scars.

19 Proximal blade segment Fig. 4

IM 5830. Lot 89-533. Northwest Temenos Dump, trench 37. Sanctuary.
Dim. 2.48 × 1.13 × 0.26 cm, weight 0.65 g.
Proximal obsidian fragment preserving about half of the blank with triangular cross-section, a faceted platform, and a very pronounced bulb of percussion.

20 Retouched blade Fig. 4

IM 5881. Lot 89-215. Northwest Temenos Dump, trench 42A. Sanctuary.
Dim. 1.49 × 0.87 × 0.26 cm, weight 0.40 g.

Medial segment of an obsidian blade with trapezoidal cross-section. Left proximal to distal and right distal to medial have direct, small, irregular, scalar, flat retouch.

21 Obsidian flake core Fig. 4

IM 6084. Lot 89-575. House XIII. Rachi.
Dim. 2.22 × 3.02 × 1.08 cm, weight 5.30 g.
Medial segment of an angular, heavily battered flake core. Specimen exhibits unsystematic core reduction. Flakes are removed in three directions on two surfaces.

22 Side scraper Fig. 4

IM 6086. Lot 1159. Trench VI. Rachi.
Dim. 2.44 × 2.02 × 0.35 cm, weight 2.1 g.
Formed on a broken secondary noncortical chert flake. Proximal end removed by four large invasive flakes. The right edge has medium, direct, irregular, marginal, steep retouch to form a distinct scraper facet. There is a slight bit of polish on the proximal ventral. The chert is high-quality lustrous material.

23 Pointed tool Fig. 4

IM 6088. Lot 1778. Trench H. Large Circular Pit.
Dim. 2.07 × 1.99 × 0.60 cm, weight 1.83 g.
Formed on a nearly complete secondary noncortical obsidian flake; platform is missing. Heavy bifacial battering gives the specimen the general appearance of a scaled piece. Irregular, direct, low, partial, scalar retouch on both the right and the left distal end converge to form a small tip.

24 End scraper Fig. 4

IM 6089. Wiseman survey. Area F (1960). Hexamilion settlement.
Dim. 1.77 × 1.69 × 0.34 cm, weight 1.10 g.
Nearly complete secondary noncortical obsidian flake. Platform is missing. Distal edge has direct, marginal, very small, steep, irregular retouch forming a somewhat sinuous scraper facet.

SPATIAL DISTRIBUTION

The flaked stone derives from several locations around the site (Table 3). The areas include the sanctuary proper (i.e., within or in close proximity to the temenos of the Temple of Poseidon), the Theater, the Rachi, the section of Cyclopean wall of Mycenaean date on the hill adjacent to the Rachi, the East Field, the Byzantine Fortress, the Later Stadium, the Loukos Field (outside the south wall of the Fortress near the south gate), and the West Cemetery (including the Filis Field). In addition, past fieldworkers also collected material from somewhat further away: the West Foundation, the Ioannou Well at the west end of Kyras Vrysi, and a location east of Hexamilia identified as the ancient settlement of Kromna. Material from all of these locations is included in the current study.

The distribution of flaked stone around the site shown in Table 3 is not random ($\chi^2 = 275$, $\alpha = 0.001$). More than half of the material comes from the sanctuary and the Theater (32.2% and 21.5%, respectively), and another significant portion was recovered from the North Temenos Dump (16.1%), which also is part of the sanctuary. It is possible, perhaps even likely, that much of this material reflects the significant reshaping of the

TABLE 3. FLAKED STONE BY AREA

Area	*Frequency*	*Percentage*
Provenience unknown	2	1.3
Sanctuary	48	32.2
North Temenos Dump	24	16.1
Theater	32	21.5
Rachi	11	7.4
East Field	11	7.4
Fortress	3	2.0
West Foundation	2	1.3
Ioannou Well	1	0.7
Kromna	5	3.4
Mycenaean wall	1	0.7
Hexamilion	2	1.3
Later Stadium	1	0.7
West Cemetery	5	3.4
Loukos Field	1	0.7
Total	149	100

plateau on which the Temple of Poseidon rests. As the building area was expanded in the Early Archaic period and later to accommodate the main cult structures, the soil and any artifacts it contained were redeposited.[67]

There is no reason to believe, however, that the soil was moved any great distance. What Morgan says concerning the Mycenaean pottery is probably true of many of the lithics:

> It is possible to trace the movement of Mycenaean pottery down these gullies in three separate places, namely, the Northwest Temenos, the theater area, and the Southeast Temenos. In all these cases it is likely that the material thus dispersed originated from points close by, perhaps on the edges of the plateau or higher up the Rachi slope. In the latter case, it may also have been associated with the red earth formed by decomposition of the conglomerate bedrock that extends down the Rachi slope.[68]

Therefore, while much of the flaked stone near the central part of the sanctuary is not in situ, it probably came from nearby. Smith argued that the bottom 0.30–0.50 m of the Temenos Dump trench excavation northwest of the temple contained only Early Helladic pottery with some obsidian; from the relatively intact nature of some of the ceramics, she suggested that while the material had washed into the gully, it did not travel far.[69] It is reasonable to assume that prehistoric and early historic occupants of Isthmia utilized the same flat area that later housed the temple since

67. The red soil mentioned in the notebooks for the sanctuary area (including the Theater) is a calcareous matrix, one component of the *caliche* that developed from the weathering of the bedrock (Hayward 1999, p. 4). Many lithics are found in the red soil of the Northwest Temenos Dump trench, the Theater, the East Terrace (Terrace 1 in Gebhard and Hemans 1992, and *Isthmia* VIII), and the Southeast Area. The pottery found in this red soil includes prehistoric, Geometric, and Archaic sherds (*Isthmia* VIII, pp. 19–27).

68. *Isthmia* VIII, p. 180.

69. Smith 1955, p. 143.

it offered a naturally level place for a variety of activities.[70] If we look at individual trenches (Table 4), the Northwest Temenos Dump trench excavation contained the most lithics (10.7%), followed by Sanctuary trench H (Large Circular Pit; 7.4%), and Theater trench 1 (6.0%).

Outside the central part of the sanctuary, the places with the most stone tools are the Rachi and the East Field, each with 7.4% of the total sample of lithics. These two areas contained domestic quarters in historical periods. Less movement of soil may have occurred in these areas, so it is likely that the lithics are closer to the location of actual use. In the East Field, the Late Roman deposits form the base cultural strata, making it less likely that there has been contamination from prehistoric deposits. Among the material in this area are four obsidian blades and a well-made obsidian blade core (IM 71-76). The presence of these items may suggest blade production and use in the 3rd and 4th centuries A.D. at Isthmia (but see below on recycling of older material).

The Rachi offers an even more intriguing scenario since it contains evidence of both domestic and industrial activities. Among the latter, dyeing, tanning, and the production of olive oil have been suggested, with the last of these the most likely.[71] Anderson-Stojanović dates the main occupation of the Rachi settlement to a period of 150 years from the mid-4th century to the end of the 3rd century B.C.[72] Among the 11 (9 obsidian and 2 chert) stone tools found there are one utilized blade, a pointed tool, and a core fragment, all of which are obsidian; there is also a chert side scraper. Several of the pieces come from well-dated contexts. For example, IM 5677 (**17**, Fig. 4) was found in room 5 of the North Building in the late-4th-century B.C. fill for the subfloor. Also, IM 5716 was found in destruction debris from the end of the 3rd century B.C. in room B of House XI.

Such tools would have been useful in domestic activities that included the cutting of meat and fibers and the scraping of hides, but it is important to note that these specific contexts may not be use deposits for the Hellenistic settlement. Morgan has identified some Late Bronze Age ceramic material from the Rachi;[73] reuse of prehistoric lithics in later periods is a possibility. Recent work by EKAS at Isthmia has confirmed the presence of a Mycenaean settlement. Survey teams found 61 LH sherds (some LH I–II, but mostly LH IIIA–B) on Rachi Marias, a ridge southwest of the Rachi settlement where the University of Chicago conducted its excavations. An additional 22 Late Bronze Age sherds were found on the slope and in the gully below Rachi Marias. The 83 sherds represent general utilitarian pottery, kitchen wares (especially tripod cooking pots), and some fine wares (kylikes). The stone tools included only a few millstone fragments and several pieces of obsidian.[74]

The lithic finds from Kromna (3.4%), the West Cemetery (3.4%), and the Fortress (2.0%) also merit some consideration. Several of the pieces from Kromna come from deposits that are either primarily Bronze Age in date or from mixed contexts. It is most likely that these lithics belong to a prehistoric domestic context. The West Cemetery and the Fortress, however, do not have any notable prehistoric material, so the stone tools from these contexts have historical associations.[75] Since burials in the West Cemetery date to the Archaic and Classical periods (6th to early 5th centuries B.C.),[76] there is no reason to place the lithics earlier. Despite the

70. A combination of excavation, geomorphological analysis (Hayward 1999), and remote sensing has revealed that the original plateau on which the Temple of Poseidon was built dipped somewhat from south to north and more mildly from west to east. Two gullies defined the northwest and northeast edges (Gebhard 1999).

71. Anderson-Stojanović 1998.

72. Anderson-Stojanović 1996, p. 63.

73. *Isthmia* VIII, pp. 435–436.

74. T. F. Tartaron (pers. comm.).

75. There is some Mycenaean pottery and a psi figurine from the West Cemetery, but only from the section south of the road; Dickey 1992; *Isthmia* VIII, p. 435.

76. See Dickey 1992; Rife and Giesen 1994, pp. 229–230; *Isthmia* IX.

TABLE 4. PROVENIENCE OF LITHIC ASSEMBLAGE

Provenience	*Frequency*	*Percentage*
UNSPECIFIC*	8	5.4
UNIVERSITY OF CHICAGO TRENCHES		
Sanctuary trench IA	3	2.0
Sanctuary trench 3	3	2.0
Sanctuary C6	2	1.3
Sanctuary C3-C6	1	0.7
Sanctuary C8	1	0.7
Sanctuary trench 26	1	0.7
Sanctuary trench 32	2	1.3
Sanctuary trench 58	1	0.7
Sanctuary trench GW4	1	0.7
Sanctuary trench R-13	2	1.3
Sanctuary trench RS-2	1	0.7
Sanctuary tunnel trench	1	0.7
Sanctuary NRA-a	1	0.7
Sanctuary east-central "E"	1	0.7
Sanctuary trench H	11	7.4
Sanctuary trench J	3	2.0
Sanctuary East Gateway	1	0.7
Sanctuary trench "theta"	1	0.7
Southwest Temenos, section A	2	1.3
Sanctuary, Southeast Area, trench 2B	1	0.7
Sanctuary, Southeast Area, trench 17	2	1.3
Sanctuary, Palaimonion, trench PIII	2	1.3
Sanctuary, Southeast Area, trench VI	1	0.7
Sanctuary, Southeast Area, Palaimonion VII	1	0.7
Sanctuary, Early Stadium, trench C	1	0.7
Sanctuary, East Terrace 7	1	0.7
NWTD** west end, dump trench	16	10.7
NWTD 2nd north trench wall	1	0.7
NWTD trench IV	1	0.7
NWTD trench 19	1	0.7
NWTD trench 37	1	0.7
NWTD trench 89-37	1	0.7
NWTD trench 42A	1	0.7
Mycenaean wall, trench 14	1	0.7
Theater trench 1	9	6.0
Theater trench I & II	1	0.7
Theater trench B	6	4.0
Theater cave	3	2.0
Theater trench IIA	2	1.3
Theater trench IV	1	0.7

disturbed nature of the burials (only 12 of 138 graves contained substantial cranial material),[77] all the ceramic finds belong to those periods, and there is no obvious reason to separate temporally the stone implements from the pottery. The function of the lithics in the cemetery, however, is an issue that cannot be addressed with the available evidence. Excavations in the Fortress east of the sanctuary have revealed that the earliest structures are Roman in

77. Rife and Giesen 1994, p. 230.

TABLE 4—*Continued*

Provenience	*Frequency*	*Percentage*
Theater trench VII	3	2.0
Theater trench 10	3	2.0
Theater buttress 17	1	0.7
Theater court	1	0.7
Theater drain, manhole II	2	1.3
Rachi trench 18F	1	0.7
Rachi trench E	1	0.7
Rachi trench I	2	1.3
Rachi trench VI	1	0.7
Rachi trench 15B	1	0.7
Rachi trench 24	1	0.7
Rachi House XIII	1	0.7
Later Stadium trench SS-1	1	0.7
Hexamilion survey area F	1	0.7
Kromna trench KR-25	4	2.7
Kromna trench KR-28	1	0.7
West Foundation trench E	2	1.3
UCLA/OSU Trenches		
East Field aqueduct well 2	1	0.7
Trench EF** 70-11	1	0.7
Trench EF 70-17	1	0.7
Trench EF 70-2 or 70-8	1	0.7
Trench EF-70-4	2	1.3
Trench EF-70-VI-3A	1	0.7
Trench EF-71-IX-1	1	0.7
Trench EF-71-XIV-4	1	0.7
Trench EF-71-VIII	1	0.7
Trench EF-71-XII-3	1	0.7
Fortress trench 69-3	1	0.7
Hexamilion trench 72-1	1	0.7
Loukos Field trench 69-9-I	1	0.7
West Cemetery trench 68-I, grave 4	1	0.7
West Cemetery trench 70-2	1	0.7
West Cemetery Filis Field 70-8	1	0.7
West Cemetery well B	1	0.7
West Cemetery grave II-58	1	0.7
Fortress survey, surface	2	1.3
Total	149	100

*The eight pieces listed in this category do not have a trench designation in the excavation databases; three of these artifacts are from the Rachi, and the remaining five are from the general area of the sanctuary.

**Abbreviations: EF = East Field; NWTD = Northwest Temenos Dump.

date; most of the archaeological remains are Late Roman, Early Byzantine, and Late Byzantine in date.[78] Intensive surface collection in the interior of the Fortress, largely ignored in earlier work, produced only two possible prehistoric sherds out of a total of over 27,000 artifacts.[79] Nonetheless, the three lithics from the Fortress could represent prehistoric rather than historic use of the area, especially since the artifacts were surface finds.

78. Jenkins and Megaw 1931–1932; *Isthmia* V.

79. Gregory and Kardulias 1990, p. 489, table 2; Kardulias 2005, p. 72, table 6.2.

The context of IM 101 (trench C3-C6, lot 224, 1954), an obsidian secondary noncortical flake with some light utilization on one edge, is of particular interest. It was found in a Classical (mid-5th century B.C.) deposit within the Classical temple. The deposit represents debris from the Archaic temple with no evidence of subsequent disturbance. The associated artifacts included iron knives and chisels, red ochre, and gold, silver, and bronze sheet pieces. Gebhard interprets the material as the debris from a workshop in which wooden boxes or furniture were manufactured.[80] The thin edges of the stone tool may have been used for carving or shaving wood and working small areas or details for which other tools may have been too large.

If IM 101 was used in this manner, it would constitute an example of a stone tool used in a craft activity. Runnels has noted the use of glass scrapers to work wood by modern shepherds and woodworkers in Greece, and one assumes that this practice is quite old.[81] Small pieces of glass (or flaked stone) allow one to work rounded shapes efficiently by shaving or planing. Runnels reports that such glass scrapers were used in the southern Argolid for the final stages of woodworking to provide smooth surfaces on shepherds' staffs and other objects. He further notes that ready access to iron tools in the southern Argolid dates to only about 1850. Thus, glass, chert, and obsidian must have played a significant role in woodworking and perhaps other activities until quite recently in some of the more isolated areas of rural Greece. The flintknapper's art was still alive and flourishing in Epiros and southern Albania in the late 19th century. Specialists (mostly Albanians) produced high-quality gun flints and strike-a-lights that they sold in bazaars and marketplaces.[82]

HISTORICAL LITHICS IN GREECE

Given the presence of knappers and their products in and around Greece in recent times, it is not unreasonable to expect that ancient peoples of the region manufactured and used such tools in all periods when metal was less readily available than in the 19th and 20th centuries. Runnels argues that chert and obsidian were used in ancient Greek and Roman times as inexpensive alternatives to metal; his seminal article on flaked stone from historical contexts sets the foundation for the examination of this phenomenon.[83] Runnels notes that the lone evidence for Early Iron Age (10th–9th century B.C.) stone tool use comes from Karphi and Vrokastro on Crete, although only the material at the former site suggests production. Flaked stone tools have been found in Protogeometric and Geometric deposits at Asine, Argos, Eleusis, and Zagora; they occur in Archaic and Classical contexts at Olympia, Argos, and Halieis.[84] Of these sites, Halieis has yielded the most lithics (n = 71) from the Archaic and Classical periods (Table 5). The dearth of production debris leads Runnels to argue that the Halieis historic assemblage reflects reuse of material that ancient residents probably picked up in the surrounding area. Because most of the material came from house contexts, Runnels suggests the tools were used in "simple cutting tasks in agriculture" and in domestic activities; the nine chert flakes found may be from threshing sledges.[85]

80. Gebhard 1998, pp. 108–109, n. 71.
81. Runnels 1975, 1976.
82. Evans 1887.
83. Runnels 1982.
84. Runnels 1982, pp. 364–365.
85. Runnels 1982, p. 371.

TABLE 5. FLAKED STONE FROM DATED DEPOSITS AT HALIEIS AND ISTHMIA

Site	*Cores/Debitage*	*Flakes*	*Blades*	*Bladelets*	*Tools*	*Total*
HALIEIS						
Archaic level D	0	2	0	2	1	5
Late Archaic–Early Classical level C	2	3	1	16	0	22
Classical–Early Hellenistic levels A–B	3	2	2	11	2	20
Classical–Early Hellenistic mudbrick deposit	2	9	2	9	2	24
Total	7 (9.9%)	16 (22.5%)	5 (7%)	38 (53.5%)	5 (7%)	71 (100%)
ISTHMIA						
No date	4	14	23	—	5	46
Early Bronze Age	0	0	1	—	0	1
Late Bronze Age (Mycenaean)	0	0	2	—	0	2
Archaic	1	8	8	—	3	20
Classical	0	4	4	—	4	12
Hellenistic	0	2	11	—	1	14
Early Roman	1	2	4	—	0	7
Late Roman	0	0	0	—	1	1
Late Archaic/Early Classical	0	0	0	—	1	1
Mixed	1	12	18	—	3	34
Late Classical/Early Hellenistic	0	0	0	—	1	1
Archaic and/or Classical	1	1	1	—	0	3
Late Roman/Early Byzantine	0	0	2	—	0	2
Geometric/Archaic	0	1	1	—	0	2
Late Hellenistic/Early Roman	0	1	0	—	0	1
Roman–Modern	0	1	1	—	0	2
Total	8 (5.4%)	46 (30.9%)	76 (51%)	—	19 (12.8%)	149 (100%)

For Halieis deposits, see Runnels 1982, p. 367, table 1.
Unlike the work at Halieis, analysis of the Isthmia material did not distinguish between blades and bladelets.

The material from Isthmia adds another significant historical assemblage to the list. It differs from the Halieis collection in the lack of threshing sledge flints[86] and the nondomestic contexts of a substantial part of the assemblage (i.e., that from the sanctuary). The chronological associations are similar, however. At Halieis, a substantial amount of the flaked stone assemblage derives from Archaic (n = 5) and Late Archaic–Early Classical (n = 22) levels, with even more from Classical–Early Hellenistic contexts (n = 44). As demonstrated in Table 5 and Figure 5, Archaic deposits at Isthmia yielded the most lithics (n = 20), followed by Hellenistic (n = 14), Classical (n = 12), and Roman (n = 8). These figures suggest continued use of stone tools at both sites throughout the 1st millennium B.C., and at Isthmia, possibly into the Early Byzantine era, although one must take note of redeposited material in the area.

Since Runnels's initial work on flaked stone from the historical era, additional data have been collected from regional surveys in Greece. The Kea survey identified 32 sites with flaked stone; of these, 20 are prehistoric, including 10 sites that are probably or certainly Bronze Age, four that are Neolithic, and six that have no specific prehistoric assignment. The remaining 12 sites are of uncertain date because they yielded only one or two undiagnostic lithics.[87] Torrence notes the possibility that many

86. See Kardulias and Yerkes 1996 for the technique of identification.

87. Torrence 1991, p. 178, table 7.3.

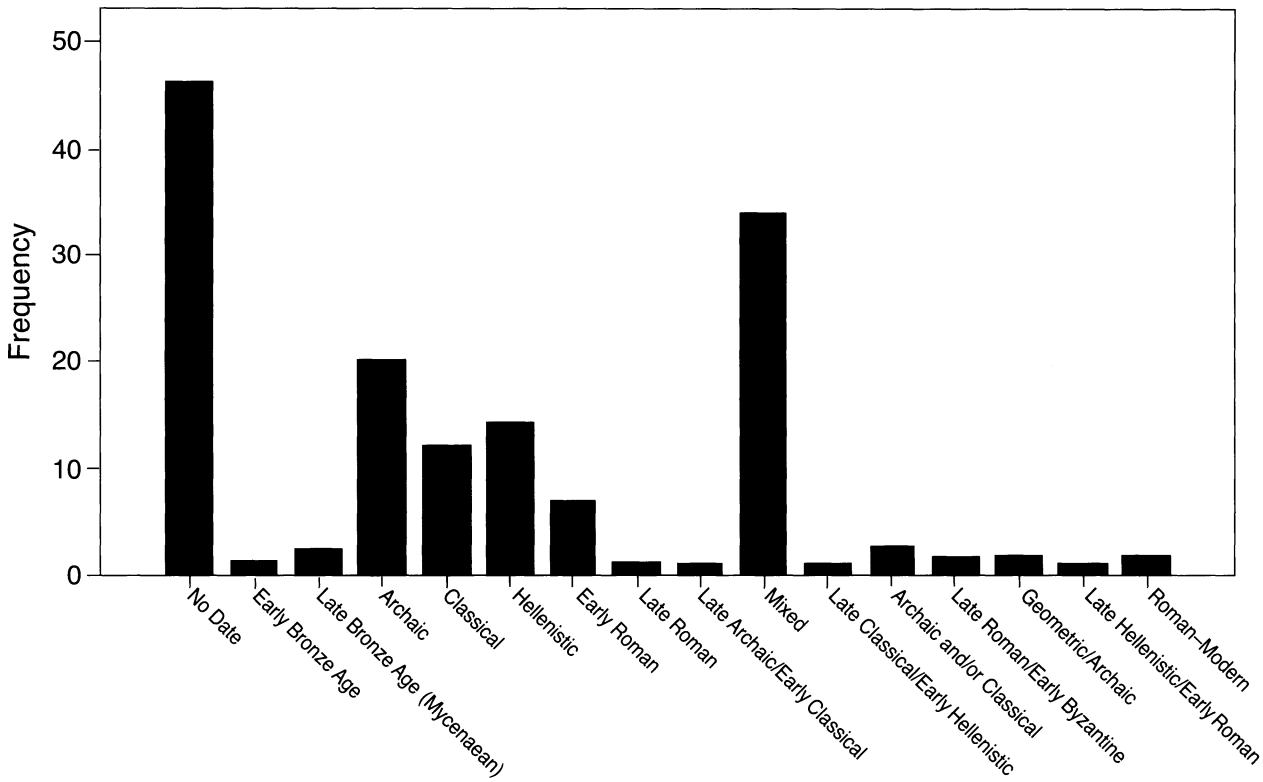

Figure 5. Chronological contexts of the lithics from Isthmia

pieces, especially blades, were reused in historical periods. She argues that while blade production was most likely restricted to the prehistoric periods or the earliest historical era, individual artifacts "may actually have been scavenged centuries or even millennia later, reused, and then discarded in new locations."[88]

Kea survey site 2 offers the best example of historical lithics. Torrence assigns the assemblage (n = 66) to a historical period on the basis of its association with Classical pottery, the lack of evidence of blade production, the ad hoc irregularity of the pieces, the absence of retouch, and the use of several flakes as cores; she suggests casual detachment of flakes with sharp edges for use as expedient tools.[89] While Torrence presents a reasonable explanation, I believe she may be too cautious in saying that blade production did not occur in historical periods. Modern or recent knappers who produce threshing sledge flints do so using a blade reduction sequence. The threshing sledge, or *tribulum,* was a common agricultural implement in antiquity, and it is likely that the technique for manufacturing the flints varied little from that used in Turkey and Cyprus until quite recently.[90]

The southern Argolid survey has added substantially to the inventory of historical sites with flaked stone artifacts.[91] There are 65 sites with flaked stone and predominantly historical ceramics; at 36 of these lithic sites, the pottery was exclusively historical. Based on the pottery, the sites and the associated lithics date from the Late Geometric to Early Modern periods.[92] The sites are located in all parts of the project area (225 km^2),[93] indicating widespread use of stone tools in historical times. Of the 669 artifacts from the 65 sites, 378 (56.5%) are chert and 290 (43.3%) are obsidian; this situation contrasts significantly with the Bronze Age sites in the region,

88. Torrence 1991, p. 183.

89. Torrence 1991, p. 194.

90. Bordaz 1969; Pearlman 1984; see also Evans 1887.

91. Jameson, Runnels, and van Andel 1994, pp. 422–538.

92. Kardulias and Runnels 1995, p. 97.

93. Jameson, Runnels, and van Andel 1994, p. 218.

where obsidian accounted for 92.2% of the flaked stone. An interesting aspect of the historic assemblage is that 173 pieces (25.9%) exhibit some retouch, more than is the case for any other period. At the same time, the number of historic stone tool types decreased, which may suggest that stone tools were used to perform fewer specific tasks than in the prehistoric period. The most common historic stone tool types in the assemblage include generalized retouched pieces (n = 85), piercing/incising tools (n = 18), scrapers (n = 14), notches (n = 10), and scaled pieces (n = 9). There are also six sickle elements, one chert tanged arrowhead, and a gunflint.[94] These types match well with those found at Isthmia (see Table 2). The southern Argolid data clearly demonstrate the extensive use of flaked stone throughout the historic sequence; the 65 sites with such material dramatically expand the inventory from the dozen or so sites known in the early 1980s.

It is highly likely that a substantial portion of the flaked stone found in other regional surveys belongs to historical periods as well. The evidence is not always abundant. For example, the Berbati-Limnes survey conducted in an area just east of Mycenae yielded only one piece of flaked stone that can be assigned to a historical period (Geometric/Archaic).[95] A large number of ground stone implements, however, were assigned to Archaic–Hellenistic (n = 34) and Roman (n = 19) times.[96] Similarly, Carter and Ydo found "occasional pieces" of flaked stone at two historic sites in the Laconia survey, but they argue it is difficult to place these in a post-Bronze Age context.[97] They outline their approach as follows: "Where lithics were found on multiperiod sites in any quantity, they were interpreted as of prehistoric date."[98] Consequently, they may understate the actual number of historic lithics, although their caution is understandable. Like other researchers, Carter and Ydo identify a number of ground stone tools as historic in date.[99]

Although somewhat more distant, the site of Buṣrā in Syria has yielded important information regarding the use of flaked stone tools in historical periods. In his study of these materials Miller makes some useful distinctions:

> For archaeological analysis it may be useful to draw a distinction between residual and recycled pieces, even though it may not always be possible to determine which description fits a particular piece of flint. Residual flints would include any artifacts from earlier industries exposed on the surface at a later period. Recycling would be the situation which can be observed ethnographically when someone picks up a residual piece and uses it as a core or tool. The reuse of pieces from earlier industries as sources of raw material of already demonstrated value can be observed at any period of stoneworking.[100]

At Buṣrā, 84 stone tools from Nabataean to Late Roman/Byzantine levels (1st century B.C.–7th century A.D.) reflect "the remains of domestic and artisanal activities in an urban commercial center."[101] The craft activities could have included the production of gemstones and seals and the scraping of leather. There is also evidence for the production of flakes and blades, which were excellent cutting tools. As in the Balkans, flints also probably served as strike-a-lights.[102]

94. Kardulias and Runnels 1995, pp. 100–102.
95. Ekroth 1996, p. 219.
96. For Archaic–Hellenistic examples, see Penttinen 1996, p. 277; for Roman, see Forsell 1996, p. 333.
97. Carter and Ydo 1996, p. 158.
98. Carter and Ydo 1996, p. 158.
99. Carter and Ydo 1996, pp. 178–180.
100. Miller 1984, p. 149.
101. Miller 1984, p. 153.
102. Miller 1984, pp. 155–156.

STONE TOOL FUNCTIONS AT ISTHMIA

Although much of the Isthmia material derives from mixed contexts, there are sufficient instances of clean deposits to indicate that flaked stone was definitely utilized in historical times. Of particular interest are the tools from the central part of the sanctuary, due to their abundance and occurrence in nondomestic contexts, and the items from the Rachi, the Hellenistic settlement. At present, it is not possible to determine the precise function of stone tools from the latter area, although the typological analysis suggests various scraping or cutting tasks may be represented. Anderson-Stojanović has demonstrated that there is no evidence to support the earlier suggestions of dyeing and tanning work in the Rachi settlement.[103] More recently, on the basis of a closer reading of the archaeological evidence, comparanda, and organic residue analysis, she has argued that olive oil production occurred at the hilltop settlement.[104]

In the sanctuary area, despite the difficulty of establishing stone tool functions conclusively, some contextual evidence is highly suggestive of particular uses. As noted above, the Large Circular Pit contained the remains of communal feasting.[105] In addition to the bones of cattle, sheep, goats, and pig (many with cut marks),[106] a vast amount of pottery was found in the pit. Among the types are kotylai, skyphoi, kraters, bowls, stewpots, and pithoi, associated with the "preparation and consumption of food and drink."[107] The lithics found in the pit could be associated with the cutting of meat in ritual feasting. Obsidian is an especially sharp material and is known ethnographically to have been used for such purposes in many places around the world, although in scenes of butchering on Archaic and Classical vases, a knife (undoubtedly of iron) is represented.[108] A number of obsidian blades were found in another sumptuary context, the ritual cave above the Theater. Of the six pieces found in the cave, one (IM 6091) was under a burner in a deposit that dates to the late 4th century, while four others were in the kitchen chute. Two of the latter, IM 2568 and IM 2559 (8, Fig. 2), occurred in a Late Classical deposit. Elsewhere in the Theater, two blades, along with pottery from the mid-4th century B.C., were retrieved from a drain. It would seem, then, that obsidian blades were used in food preparation and perhaps other activities in two parts of the sanctuary.

Obsidian blades may also have been used at Isthmia in the ritual sacrifice of animals in the area of the East Temenos and Palaimonion pits. Gebhard and Reese have identified a large quantity of faunal remains belonging to the 7th through the 5th and 4th centuries B.C. in the East Temenos.[109] Miller notes that expedient stone knives with extremely sharp edges are one type of tool recommended in Islamic tradition for butchering animals, and he further suggests that some of the lithics from Buṣrā served this purpose.[110] While some animals at Isthmia were butchered, the evidence indicates that the cattle in the Palaimonion pits were not dismembered but were burned whole. The cutting of soft tissue such as muscle and skin, however, would not necessarily leave evidence on the skeletal remains.

103. Anderson-Stojanović 1996; cf. Kardara 1961.

104. Anderson-Stojanović 1998.

105. Risser and Gebhard, forthcoming.

106. Gebhard and Reese 2005.

107. Risser and Gebhard, forthcoming.

108. See van Straten 1995, pp. 104–113.

109. Gebhard and Reese 2005, pp. 138–140.

110. For detailed discussion, see Miller 1984, p. 156.

ACQUISITION OF RAW MATERIAL

Melos was the probable source for all the obsidian in the Isthmia assemblage, and it is important to consider the systems of exchange through which raw materials were obtained from this island, especially in different time periods. In her detailed study of the large obsidian sources on Melos, Torrence argues persuasively that local settlements did not control access to the material, even in the Bronze Age when Phylakopi was a substantial polity.[111] Based on the fact that no major settlement was located near the two key quarries on the island and that the debris at the sources reflects largely unsystematic working, Torrence concludes that passersby from the mainland and other islands simply reduced nodules roughly and then carried them away during fishing and other expeditions. The primary intent of these trips was not the collecting of obsidian. Furthermore, the evidence from surveys in the southern Argolid, Messenia, and elsewhere indicates that once obsidian made its way to the mainland, the production of finished tools did not occur under the watchful eye of state or palace administrators (see below).

In general, the ancient Aegean economy was not characterized by the centralized control of all crafts. The focus of elites was on those activities that generated wealth, and the production of flaked stone tools in all likelihood did not fall into this category.[112] I suggest that the situation in historical times was similar, with smaller-scale production and use evinced by the reduced quantity of obsidian found on sites after the Bronze Age. People living on the eastern coast of the Peloponnese could have procured obsidian directly from Melos as part of embedded procurement forays,[113] for example, while fishing for tunny or en route to other destinations.[114] Either as an alternative or as a supplementary action, people from the Geometric period and later could have scavenged obsidian from prehistoric sites. The prehistoric components in and around Isthmia may have served as sources for some of the material found in historic deposits. Some pieces may have been brought from Melos for use in Geometric and later times as well, but it is not possible to determine which specimens those might be.

The acquisition of chert was simpler. There are several major outcroppings of chert in the vicinity of Isthmia. One of these sources is on the west slope of Acrocorinth, where a reddish brown chert of moderate flaking quality is exposed; several artifacts in the Isthmia collection are made of this type of material. The exact provenience of the quarries for the material used at Isthmia cannot be determined at this time, but it is likely that at least some of the chert came from these local sources.[115]

Residents of Isthmia and neighboring communities during historical periods may also have exploited chert from a region about 10 km southeast of the Asklepieion at Epidauros. Newhard has identified a good- to high-quality chert in a series of outcrops in this area.[116] His research suggests that in the Bronze Age, people from Midea, Tsoungiza, Mycenae, and Lerna utilized what he calls the Ayia Eleni chert; they obtained the material in embedded procurement forays, perhaps with transhumant pastoralists transporting the raw material from the source to the various sites. The

111. Torrence 1986, pp. 169–171, 214–216.

112. For detailed discussions of the nature of the obsidian trade, the presence of limited or open access, and the role of specialization, see Torrence 1979, 1986; Runnels 1983; Perlès 1990b; Kardulias 1992; Newhard 2003.

113. Cf. Binford 1979, pp. 259–261; 1980, pp. 10–12.

114. Kardulias 1992, pp. 434–435.

115. Chert has proved to be notoriously difficult to source, but see Foradas 2003 and Luedtke 1992, pp. 117–122, for a technique with some potential. Unlike obsidian, for which trace elements provide unique signatures (Cann and Renfrew 1964; Dixon, Cann, and Renfrew 1968; Renfrew and Dixon 1976), a characteristic chemical profile for chert and flint has been elusive because the rock occurs in extensive sedimentary layers that can vary in chemical structure within the same geological formation. Scholars have had difficulty identifying individual sources because of the variety of processes involved in the creation of chert and its subsequent transformation through weathering.

116. Newhard 2003, pp. 73–76.

same source was certainly within reach of the northern Corinthia in the 1st millennium B.C. and later, either by direct access or regional down-the-line trade. Elsewhere, Blitzer has identified 15 chert sources within a one-hour walk of Nichoria that could have been used in various time periods, although not all of the material is of equal quality.[117] In short, people in the Corinthia, the Argolid, Messenia, and other regions clearly had ready access during historical times to sources of chert that they could use for various implements. Acquisition of the raw material was basically unrestricted and was not controlled by specialized procurers or merchants.

Chert was particularly useful for implements such as sickle or threshing sledge elements that are subject to considerable pressure; chert withstands the forces of use better than obsidian, although Ataman reports the use of obsidian in some instances.[118] As noted earlier, the threshing sledge was commonly used in the Mediterranean basin during antiquity.[119] The single sickle element in the Isthmia assemblage was found at Kromna in a probable Bronze Age context and is evidence of plant processing. The small number of other chert pieces may have been associated with the production of sickles and threshing sledge inserts, as Runnels suggests for such material at Halieis.[120] While metal sickles may have largely replaced stone ones by the late 1st millennium B.C.,[121] the use of threshing sledge flints continued; their rarity at Isthmia may have several explanations. Perhaps no threshing floors existed in the immediate vicinity of the sanctuary, or the residents may have used the other major method of threshing grain, in which animals were tethered to a central pole and walked over the harvested grain.

THE QUESTION OF CRAFT SPECIALIZATION

A crucial issue in any reconstruction of a past culture is the nature of its economic system. From the materialist perspective, the mode of production in a society determines the network of relationships necessary to undertake successfully any type of subsistence. Intragroup relations influence not only intergroup alliances but also basic principles that become ingrained as beliefs with high practical, as well as symbolic, value. For example, a foraging lifestyle imposes various restrictions as a result of the dispersal and seasonal availability of resources; foragers attempt to minimize the risk and uncertainty inherent in their subsistence through reciprocity.[122] For the archaeologist, artifacts may attest to basic subsistence practices: for example, stone tools such as sickles and querns may be evidence for the cutting and milling of grains; points may have been used for killing animals; and knives may have been used for cutting meat. Lithics also can provide information on patterns of exchange and the differential organization of labor within and between groups.

There is clear evidence from contexts such as the potters' quarters in the Kerameikos in Athens and Corinth that certain crafts were the domains of specialists.[123] Those arts that generated significant wealth certainly drew the attention, if not the active involvement or interference, of the state in their activities. There is, however, no reason to believe that all crafts developed along similar lines. As Rosen has stated, "craft

117. Blitzer 1992, pp. 713–714.

118. Ataman 1999, pp. 220–221.

119. White 1970, pp. 449–450.

120. Runnels 1982, p. 371.

121. The only metal farming tools that Raubitschek (*Isthmia* VII, p. 121) identified at Isthmia are iron pruning hooks, but sickles probably also were used in farming activities around the site. The presence of pruning tools is consistent with Anderson-Stojanović's (1998) suggestion that processing of olive oil occurred on the Rachi; one iron hook (IM 448) was found in an Early Hellenistic level in trench II on the ridge (*Isthmia* VII, p. 127).

122. See Sahlins 1972, pp. 191–220; Harris and Johnson 2000, p. 112; Johnson and Earle 2000, pp. 44, 177–178; Binford 2001, pp. 38–40.

123. Noble 1969, p. 146; *Corinth* XV.3.

specialization need not be examined as a single monolithic phenomenon. . . .There is nothing requiring that origins and development of different crafts be dictated by the same factors, nor that they be on the same developmental trajectory. . . . Accepting an elite-power-control role for the rise of specialization in some commodities, like metals, examination of the lithic systems suggests that there may be more than one path leading to the phenomenon we call specialization."[124] Even in the Bronze Age when knappers turned out flaked stone artifacts by the thousands, the evidence suggests that Mycenaean elites on the mainland followed a hands-off policy with respect to lithic production. Parkinson has demonstrated that in Messenia the palace did not regulate the manufacture of stone tools; there was a main production site, but it was not at the palace, and thus it was probably not under royal supervision.[125] I have noted a similar system in the southern Argolid and elsewhere in the Aegean.[126]

To qualify as a specialization, an activity must (1) require a particular skill whose practice is limited to certain individuals in a community; (2) occur in a location distinct from other activities; and (3) make it necessary for a practitioner to abandon (or nearly so) direct subsistence activities such as farming or hunting; the specialist exchanges his or her products or services for necessary foodstuffs. There certainly are examples of full-time lithic specialization in the archaeological, ethnographic, and ethnohistoric literature. At the site of Colha in Belize, for example, Shafer reports obsidian workshops with massive amounts of manufacturing debris (ca. five million pieces per cubic meter in a Late Classic deposit, and over 600,000 per cubic meter in a Late Preclassic workshop).[127] A number of structures at Teotihuacan seem to have been devoted to the production of obsidian artifacts for export.[128] Spanish chroniclers recorded the activities of Aztec stone artisans in 16th-century Mexico.[129] These knappers produced large quantities of obsidian blades that people traditionally used for knives (ritual as well as domestic), weapons (e.g., the Aztec *macuahuitl,* a wooden paddle studded with obsidian blades and used as a sword), and other tools. The Spanish also used some of the native-produced tools even though they possessed metal.

Clark explains the structure of contemporary Lacandon Maya knapping as a specialty that the individual practices in a section of his home on a part-time basis.[130] In addition, Clark found that production of blades and points occurred in separate locations, the desired end products were missing from workshops, and a low blade-to-core ratio exists in the debris. Gallagher's study of hide scraping in Ethiopia is useful for the detail he provides on the types of tools used and the process by which implements are exhausted and finally discarded; he also provides important insights on the disposal of production detritus.[131] What this and other research indicate is that specialization is indeed not a monolithic phenomenon; it can and does vary along a continuum from part-time and decentralized to full-time and highly centralized.

If we look at quantity of debris and final products, clear patterns begin to emerge. Each episode of flintknapping produces hundreds to thousands of individual pieces that vary in size from large flakes to tiny slivers. Clark counted over 100,000 flakes on the floor of a Maya stone worker's house;

124. Rosen 1997, p. 113.
125. Parkinson 1999.
126. Kardulias 1992, 1999; Kardulias and Runnels 1995, pp. 105–108.
127. Shafer 1991, p. 31.
128. Millon 1967; see, however, Clark's (1986) reassessment of the extent of this trade.
129. Clark 1982, pp. 356–364.
130. Clark 1991.
131. Gallagher 1977.

this amount represents the unusable production debris.[132] The workshops at Colha clearly contain sufficient material to satisfy the requirements of a craft specialty on the basis of quantity. In terms of sheer numbers, the flaked stone assemblage from Isthmia does not meet the requirements of specialization. The entire collection could have been produced easily in a few work sessions. The various time periods represented, however, indicate that the manufacture and/or use of the stone tools took place over more than a millennium; both the skill in preparing the pieces and the need for them in various tasks thus represent a long-standing tradition.

While the quantity of lithic material does not necessarily indicate specialization, two other factors should be considered. First, the assemblage contains a very small number of pieces that represent production (decortication flakes, cores, crested blades) and a high percentage of finished items (especially blades). Conversely, the proportion of tertiary flakes (3.4%) is very low. This evidence suggests that the locations of manufacture and use were spatially discrete, one criterion for specialization that is frequently cited.[133] Second, the focus of the production trajectory seems to have been the manufacture of blades, which comprise 58.3% of the sample from Isthmia. Considerable skill is required to prepare blade cores and to detach the elongated symmetrical pieces. While the quantity of material at Isthmia and other historical sites in Greece does not reflect full-time specialization, the high quality of a significant proportion of the assemblage attests to the work of part-time artisans of some skill.

Rosen has proposed a model for lithic production in the Levantine Chalcolithic and later periods that may have some bearing on the situation in Greece. He argues for a "two-tiered hierarchical structure, consisting of ad hoc tools manufactured on-site by nonspecialized users for a range of domestic tasks, and semispecialized manufacture of blade-bladelet tools and celts, centered at production sites."[134] Ad hoc tools include notches, denticulates, borers, retouched flakes, and scrapers whose production requires little specialized skill. These are the kinds of implements that most farmers could have easily made for themselves. In recent times, people often used impromptu scrapers of glass to undertake basic cutting and scraping.[135] As Flacelière notes, Hesiod made all the tools he needed, and it is likely that farmers continued that tradition in later periods, since farming was "fairly rudimentary" in Classical times.[136] Farmers in all periods probably made ad hoc stone tools occasionally. These expedient tools required little specialized knowledge to produce, yet they were used to perform a series of important tasks. The manufacture of blades and certain other flake tools is a more complex process that necessitates skill possessed by few in a community. The assemblage from Isthmia exhibits the kind of multitiered system that Rosen describes for the Levant in which both specialized and nonspecialized tools were produced, used, discarded, and in some cases recycled. The residents of Isthmia followed a pragmatic approach in their use of stone tools.

132. Clark 1991, p. 264, table 6.
133. E.g., Tosi 1984, p. 24.
134. Rosen 1997, p. 104.
135. See Runnels 1976; Kardulias 2000, p. 38.
136. Flacelière 1965, pp. 117, 126.

CONCLUSION

Lithic finds from excavated contexts at Isthmia suggest that flaked stone tool production and use may have continued in historical times. It is thus possible that old technologies with demonstrated utility were maintained or resumed. Although metals were important in tool manufacture, the distribution and availability of such implements probably depended on a variety of factors, including cost. Certainly the dominant use of metals in the Early Iron Age was for elite objects (e.g., weapons, fibulae) and ritual or votive items (e.g., cauldrons, figurines). The number of utilitarian items forms a limited inventory. With an enlarged trade system beginning in the Archaic period, access to metals widened and the variety of bronze and iron tools in the archaeological record increased significantly. Despite this enhanced access to metal, stone tools persisted. This is true even in the Near East, where metal was more common at an earlier date and where, in Rosen's words, "the displacement of lithic technology by metallurgy was a long and complex process."[137]

At Isthmia, the stratified deposits provide important evidence for this phenomenon, and research on material from other sites such as Halieis is similarly suggestive. One key question that remains open is the degree to which the recycling of tools occurred. Answering this particular question and others posed by the Isthmia assemblage will help us grasp some important nuances of the ancient economy.

137. Rosen 1997, p. 159.

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