# CHAPTER 4

# Catalogue of Miscellaneous Finds from the Southern Area

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The descriptions and catalogues in Chap. 4.1–4.7 include a variety of materials recovered through 1997 in important stratigraphic contexts within the area of the Minoan civic buildings. The chapter contents do not include wall or construction plasters (see Chap. 2) or pottery (see Chap. 3). They may not include all minor objects found in fills. Since the studies in both parts of *Kommos* I focused on the finds from all areas through 1985, many of the objects from the civic buildings are discussed therein and are sometimes only mentioned in the present chapter. Also, some of the main studies of find categories (e.g., loomweights, metalworking, and stone tools) are in the two parts of *Kommos* I, where the objects are well illustrated. Illustrations here, therefore, have been kept to a minimum. Effort has been made to reference each object to the archaeological context within which it was found, often in the form of citation of the stratigraphy as revealed through stylistic ceramic horizons. Those from post-Minoan contexts (where some may still be Minoan) are usually to be found in *Kommos* IV, which discusses the Greek Sanctuary.

CHAPTER 4
Catalogue of Miscellane

## 7. Faunal Remains and *Murex* Dye Production

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For Bronze Age flora recovered from the Kommos site, including much of the Southern Area, the reader should consult "The Modern Flora and Plant Remains from Bronze Age Deposits at Kommos," by C. T. Shay and J. M. Shay, *Kommos* I, Part 1 (1995), chap. 4, especially pp. 120–62. See also tables 4.10–4.11 and 4.13 there. Also, and by the same authors, see "Charred Seed Remains in Bronze Age Levels at Kommos," app. 7.7 in *Kommos* IV, Part 1 (2000). Burnt levels that produced significant charcoal remains were more common in the Minoan houses in connection with cooking and other household activities than in the southern "civic" buildings. Within Buildings T and P enormous beams were used to support ceilings and strengthen walls, but over time and without a major conflagration they simply rotted away. The only evidence for their existence is usually clay and plaster impressions of ceiling beams (Pls. 2.23–2.27) and empty vertical chases in some of P's walls (Pls. 1.78A–D). A single small ceiling beam of evergreen oak was found, however, in burnt Room 25b of Building T. In the LM IA kiln in the South Stoa, we found that the fuel used, probably brush, was completely consumed, so that it became ash, and therefore its wood types were unidentifiable. (*Eds*.)

## General Introduction: Minoan Exploitation of Animals in the Cretan Landscape

Through the millennia, the island of Crete with its diverse landscape has hosted a vast range of wildlife. From the thick pine forests of the west to the more naked landscapes of the central and eastern regions, Crete supports a network of ecosystems suitable to a number of species. In its 8,259 $km^2$ of land mass, the island supports over 1,700 species of plants, 76 of which have been introduced by humans over time (Turland, Chilton, and Press 1993). The fertile soils and temperate climate of Crete have allowed the successful introduction of these 76 floral species, which have domestic, therapeutic, and ornamental uses. Of the 1,630 indigenous plant species, 139 are endemic to Crete, creating a unique environment for humans and animals alike.

In the surrounding Aegean and Libyan Seas, thousands of marine species thrive, including sea flora, sponges, echinoderms, crustaceans, molluscs, fish, and a species of sea turtle (*Caretta caretta*). Several species of marine mammals can also be found around the island. The monk seal (*Monachus monachus*), for example, can still be spotted on some isolated beaches of Crete, and 11 species of whales and dolphins can occasionally be seen offshore. The variation between bedrock shorelines and sandy ones allows for a diverse array of sublittoral species like crustaceans and molluscs, many of which are edible.

The Minoans, as far as we can infer on the basis of zooarchaeological data, exploited marine species for food, bait, and shell ornaments. Bivalves in particular can be found in abundance in archaeological sites around Crete. Crustaceans, echinoderms, small fishes, and soft molluscs like squid, cuttlefish, and octopus are more elusive in Minoan faunal samples, likely due to poor preservation in soil; however, frescoes like the Fisherman from Thera and finds of bronze hooks attest to fishing practices in the Minoan period. The Fisherman fresco depicts a boy holding lines of dolphin fish (*Coryphaena hippurus*), indicating that this particular species was likely exploited for food by the Minoans. Naturalistic frescoes like the Flying Fish (either *Hirundichthys rondeletii* or *Parexocoetus mento*) from Phylakopi and the Dolphin fresco (*Delphinus delphis* with a mackerel or mullet-type fish) from the Queen's Megaron at Knossos show a knowledge and an appreciation of marine life. Marine Style pottery from LM IB reveals a familiarity with marine mollusc forms and diversity of both hard and soft species.

The octopus (*Octopus vulgaris*), for example, is shown commonly on pottery from this period, and more recently, a jug depicting what may be a cuttlefish (*Sepia officinalis*) has been identified by Rutter (Chap. 3.1) at Kommos. Minoans, therefore, had a close relationship with the sea and its creatures. Fish and molluscs were exploited as food resources and provided inspiration for decorative motifs on pottery and frescoes. We do not have any indications as to whether sponges and other sea plants were exploited in the Minoan period.

Four mountain ranges on Crete with fertile plains in between provide homes to hundreds of animals, indigenous and introduced. At least sixteen species of amphibians and reptiles live on Crete, mostly consisting of frogs, geckos, lizards, and snakes. Only one tortoise (*Testudo marginata*) roams the island today, a descendant of its Pleistocene counterpart *Testudo marginata cretensis* (Brinkerink 1996: 207). The Mediterranean chameleon (*Chamaeleo chamaeleon*) must have been a later introduction to the natural history of Crete, since in the Mediterranean region this species occurs only in southern Iberia and in the Canary Islands (Arnold, Burton, and Ovenden 1978: 260). Four species of snakes currently live on the island, none of which are venomous. Snake tubes and snake goddesses attest to the importance of these animals in Minoan ritual. Snake remains are occasionally found in faunal samples from Crete, perhaps suggesting that live snakes may have been kept for use in Minoan religion; however, snakes burrow, and so their remains can be intrusive in any level of occupation.

More than 240 birds, migratory and indigenous, live on Crete, including shorebirds, wildfowl, birds of prey, and passerines. Visitors like the hoopoe (*Upupa epops*) and swallows (*Hirundo rustica, H. daurica*) are summer residents (Handrinos and Akriotis 1997). Their short annual visit, however, did not go unnoticed by the Minoans, who painted graceful renditions of them on walls and pots from Crete and Thera. Who can forget the wonderful painting of hoopoes and chukars (*Alectoris chukar*) from the Caravanserai at Knossos? Doves (columbids) and owls (strigids), year-round residents of Crete, are common themes on Minoan seals. Birds of prey, particularly the eagle, may have inspired the renditions of the griffin, a royal or sacred insignia of the Minoans and Mycenaeans. Eagles indigenous to Crete include the golden eagle (*Aquila chrysaetos*) and Bonelli's eagle (*Hieraaetus fasciatus*); both live on the island throughout the year.

Indigenous birds commonly hunted for consumption include anatids, phasianids, scolopacids, columbids, and turdids. These families may have been commonly exploited for food in the Minoan period, although such a practice is not clear from the scanty avian remains from sites around the island. At Kommos, Reese (1995c) and G. E. Watson identified 26 of 70 bird bones from the Minoan town as columbids, suggesting that doves/pigeons may have been kept or trapped for food by local inhabitants. The contexts of these dove remains span some 600 years of site occupation, however. In general, there do not exist a great number of archaeological bird bones to warrant the belief that birds were exploited heavily for food in the Minoan period. The absence of bird bones in some contexts may be a taphonomic problem of preservation rather than evidence for their total absence.

At least 28 species of mammals live on Crete. One suspects that there are more unreported species because there has never been a systematic study of extant small rodents (moles, shrews, mice, voles) on the island. The exception is the work done by Payne (1995), and Reumer and Payne (1986) based on archaeological remains and owl pellet examination. More work has been done on the local Pleistocene rodent remains (see Bate 1905, 1942; Kuss 1970; Mayhew 1977). A notable species of insectivore is Zimmermann's white-toothed shrew (*Crocidura zimmermanni*), which is endemic to Crete and represents a likely remnant from the Paleolithic fauna of the island (Reumer 1996). A few other introduced species of insectivore are extant today.

Apart from the domestic dog and cat, the only carnivores on the island are mustelids (*Mustela nivalis*, *Martes foina*, *Meles meles*). There are unconfirmed rumors of a local wild cat (*Catus agrius* or *silvestris*), but with so many feral domestic cats, it is hard to believe that this wild species could remain untainted through breeding with feral populations. There is zooarchaeological evidence from Kavousi that Minoans exploited mustelids for food, particularly the badger (*M. meles*) (Snyder and Klippel 1996). The red fox (*Vulpes vulpes*), although common on the mainland, was apparently never introduced to the island. Other small introduced mammals found in Minoan deposits are hare (*Lepus europaeus*) and hedgehog (*Erinacaeus concolor*). These have no known predecessors in the fossil record of the island. Hare remains are commonly identified from Minoan sites, suggesting that this animal was hunted to supplement meat intake.

Most of the larger mammals are domesticated and have been introduced by humans for food, transport, traction, hunting, companionship, or secondary products such as wool, skin, horn, and milk. These introduced species include suids, cervids, equids, and bovids. Most notable of these is the wild goat known locally as the *kri-kri* or *agrími* (*Capra aegagrus creticus*). The *kri-kri* has a symbolic association with the island, although populations are dwindling in the only four conservation areas in and around Crete. The wild goat is probably not indigenous to Crete, since predecessors do not exist among Pleistocene bone remains. The earliest remains of goat on Crete come from Neolithic deposits, suggesting that early settlers brought the *agrími* to the island around 6100 B.C. (Porter 1996). The apparent introduction of this species to Crete has led Rackham and Moody (1996: 47) to believe that the *agrími* is a feral inhabitant rather than a wild one. Goat is predominant in many zooarchaeological assemblages from excavations around Crete, although distinguishing between domesticated and feral goats is not an easy task. Male a*grímia* are generally larger than domestic rams and castrated individuals, but the females of the modern breeds are within the same size range as the females of the feral breed. *Agrímia* have therefore remained elusive in the archaeological record. Only the thicker horns of the mature male *agrími* can be identified with certainty, although in a large faunal assemblage with good bone preservation, male a*grími* skeletal elements can often be distinguished from other goat bones osteometrically. The Minoans, who herded domestic sheep and goats, would not have relied on hunting feral populations for meat. Perhaps they hunted *agrímia* opportunistically or for ritual purposes. Porter (1996) argues that the "antelopes" of the Theran frescoes are really renditions of wild goats with autumn rut fur colors. In this context, *agrímia* may actually be common or sacred symbols of harvest time.

Domestic sheep (*Ovis aries*) were introduced to Crete as early as the Aceramic Neolithic, as shown at Knossos (Jarman and Jarman 1968) and Phaistos (Wilkens 1996). There is good evidence from various sites in Crete that pigs were also herded. Large tusks found in faunal samples suggest, however, that wild boar may have been introduced, or simply that tusks were traded for industrial purposes from adjacent lands. Wild boar remains have been reported from Tylissos (Keller 1911), Phaistos (Pernier 1935), Knossos and Eleutherna (Nobis 1989, 1990), and Prinias (Wilkens 1996).

Other meat consumed on Crete was venison. At least one species of deer, *Dama dama*, was hunted by the Minoans, probably having been introduced to the island by early settlers. Cervid fossil remains from cave sites on the island include those of dwarf deer (*Candiacervus* spp.), unrelated to the red or fallow deer (Reese, Belluomini, and Ikeya 1996). There is a question concerning the presence of roe deer (*Capreolus capreolus*) on the island because of the identification of a few smaller mature cervid bones and characteristic antler fragments (see Jarman 1996: n. 19), but these could also be remnants of the dwarf deer identified in the fossil record of Crete (Jarman 1996: 215). A few analysts have also reported red deer (*Cervus elaphus*) remains in some Minoan samples, such as LM IIIC Chania (Persson and Persson 2000), and the LM II Unexplored Mansion at Knossos (Bedwin 1984). Such classifications are problematic because red deer is typically found only on the mainland. Identification is hindered by a size overlap between male fallow deer and female red deer, and the similar skeletal morphology, save for the antlers. We can be certain, however, that cervids were occasionally hunted by Minoans. They are accordingly found in many faunal assemblages from excavations on Crete.

Domestic cattle were introduced in the Neolithic period. It is likely that cattle were used in field traction as in modern times, although occasional butchered bones indicate consumption as well. Three subspecies of cattle have been distinguished on Crete, *Bos taurus* and a smaller, more gracile subspecies (sometimes named *B. taurus creticus*), and suspected auroch (*B. primigenius*) remains. The remains of auroch have been identified from Neolithic Knossos, Aghia Triada, Malia, Tylissos, Phaistos, and Archanes (see Jarman 1996: n. 6). These remains along with bull-leaping frescoes depicting large-sized bulls suggest that the auroch, or wild cattle, was once part of the Cretan landscape (Nobis 1996).

Equids seem to have been later introductions. No equid remains have been identified from Neolithic sites from Crete, suggesting that the Minoans introduced asses and, later, horses to the island. One exception may be a single donkey (*Equus asinus*) bone recovered from a supposed Late Neolithic context at Knossos. This sample, however, may be contaminated with material from later levels (Jarman 1996). The earliest sign of equids in Crete thereafter comes from LM I contexts such as the donkey remains from LM I Tylissos (Hazzidakis 1912). Some archaeologists believe that horses may have been introduced by Mycenaean mainlanders in LM II (Rutter, pers. comm.). This suggestion seems to be supported by the faunal samples from the island, as few or no horse bones have been reported from contexts earlier than LM II; however, earlier seals from Knossos and Aghia Triada dating to not later than LM IB depict horse-drawn chariots of the B and C typology, indicating that horses and chariots may have been brought into Crete by Minoans perhaps as early as the later part of the MM period (see Evans 1964 [reprint]: vol. IV, pt. 2, 816 and 828). Although these seals were found on Crete, one could argue that they could have been made elsewhere and brought to the island. Equids were used primarily for human transport and as beasts of burden. There is no evidence that equids were ever eaten in Prehistoric or Historic Greece, and ethnographic information from modern Crete suggests that equids are rarely used there for field traction.

The connection of the Minoans with the landscape of Crete and the manner in which the environment of the island was altered after their arrival to suit their lifeways can be partly understood by examining the change in island fauna over time. Table 4.6 lists the indigenous mammalian fauna of Crete before the arrival of human settlers, and changes in the fauna after their arrival. The fossil information was collected from various studies of paleontological remains from the Pleistocene period (P) sites on Crete. This list of Paleolithic mammals may not be complete, since some species may have yet to be identified or discovered. The Aceramic Neolithic period (AN) marks the time of the first settlers. The mammals listed under this category have been found at the earliest human habitation sites on the island ca. 7000 B.C., such as Knossos. The following Neolithic period (N) reveals an increase in the number of human sites across the island. The Minoan period (M) marks the first settlements of people identified with the Minoan culture by their artifacts and architecture. The Historic period that follows (G) refers to Historic Greek sites from the Protogeometric to the Hellenistic periods. (RM) refers to Roman and medieval zooarchaeological information, and mammals found on the island today (T) are listed in the last column.

The list does not include flying mammals (i.e., bats) or sea mammals (seals, cetaceans), since these animals do not require human intervention to reach the island. Nor is there evidence from either faunal or iconographic sources that these mammals were exploited in any way by the human settlers.

The Pleistocene fauna found on Crete are typical of those found on islands. The larger mammals such as elephants, hippopotamuses, and deer experience island “dwarfing” over time because of the limited resources and roaming ranges (Foster 1964), and population inbreeding. On the other hand, rodents become very large, a phenomenon also typical of island populations, owing to lack of predators (Heaney 1978). *Kritimys*, for example, is a giant rodent the size of a small dog. These species, along with the otter and mouse, became extinct before the arrival of humans; there is no archaeological deposit on Crete containing anthropogenic Pleistocene mammal remains (Hamilakis 1996). The badger, the beech marten, and

Table 4.6. Mammalian presence on Crete from the Pleistocene period to the present day (after Jarman 1996).

| Species | Common name | P | AN | N | M | G | RM | T |
|---|---|---|---|---|---|---|---|---|
| *Lutrogale cretensis* | Otter | • | | | | | | |
| *Elaphus creticus* | Pygmy elephant | • | | | | | | |
| *Hippopotamus* | Pygmy hippo | • | | | | | | |
| *Candiacervus spp.* | Pygmy deer | • | | | | | | |
| *Kritimys spp.* | Giant rodent | • | | | | | | |
| *Microtus minotaurus* | Mouse | • | | | | | | |
| *Meles meles* | Badger | • | • | • | • | • | • | • |
| *Martes foina* | Beech marten | • | • | • | • | • | • | • |
| *Crocidura* | White-toothed shrew | • | • | • | • | • | • | • |
| *Sus scrofa* | Pig | | • | • | • | • | • | • |
| *Ovis aries* | Domestic sheep | | • | • | • | • | • | • |
| *Capra hircus* | Domestic goat | | • | • | • | • | • | • |
| *Bos taurus* | Cattle | | • | • | • | • | • | • |
| *Canis familiaris* | Dog | | • | • | • | • | • | • |
| *Capra aegagrus* | Wild goat | | | • | • | • | • | • |
| *Dama dama* | Fallow deer | | | • | • | • | • | |
| *Lepus europaeus* | Brown hare | | | | • | • | • | • |
| *Mus musculus* | House mouse | | | | • | • | • | • |
| *Suncus etruscus* | Savi's pygmy shrew | | | | • | • | • | • |
| *Equus asinus* | Ass | | | | • | • | • | • |
| *Equus caballus* | Horse | | | | • | • | • | • |
| *Erinaceus concolor* | Hedgehog | | | | • | • | • | • |
| *Felis catus* | Domestic cat | | | | • | • | • | • |
| *Oryctolagus cunnilicus* | Rabbit | | | | | | • | • |
| *Apodemus* spp. | Field mouse | | | | | • | • | • |
| *Mustela nivalis* | Weasel | | | | | | • | • |
| *Rattus norvegicus* | Brown rat | | | | | | • | • |
| *Rattus rattus* | Black rat | | | | | • | • | • |
| *Acomys cahirinus* | Spiny mouse | | | | | • | • | • |
| *Glis glis* | Edible dormouse | | | | | | | • |

AN = Aceramic Neolithic
G = Greek (Protogeometric–Hellenistic)
M = Minoan
N = Neolithic
P = Pleistocene
RM = Roman and medieval
T = contemporary

the white-toothed shrew survived any climatic or environmental change and still live on Crete.

With the arrival of humans, an influx of domestic animals occurred in the Aceramic Neolithic period, the evidence for which comes exclusively from Knossos. Pig, sheep, goat, cattle, and dog appeared for the first time on the island. Clearly, the first human settlers came with the basic necessities to ensure their livelihood. Jarman (1996) remarks on the technology and resource of the people at the time to be able to transport animals on what must have been a long journey. It is likely that these travelers knew to what conditions they were going. Mariners would have landed on the island and determined its suitability for occupation before the settlers committed themselves to a life on a new land. Pigs were brought presumably for meat, sheep and goat for their primary and secondary products, and dogs for hunting, herding, and companionship. Cattle would have been transported with the intention to cultivate fields. A large animal like a cow or bull would have been too difficult to transport only as a food resource, especially when pigs and smaller bovids had been brought over with this intention. Cattle provided traction power, load transport, and milk.

By the Neolithic period, wild goat and fallow deer begin to appear in faunal samples from the island. It is difficult to determine whether these animals were ever herded, or whether they were brought in as game (Davis 1984). Both the fallow deer and the *agrími* may have been originally herded by Neolithic peoples on the island, but feral populations during the Neolithic period may have been established by escapees from the herds. To date, there is no compelling archaeological evidence to suggest that either fallow deer or *agrími* were herded in the Minoan period. Feral populations established in the Neolithic period would have continued flourishing even after the Neolithic way of life was altered by the incoming Minoans. Of course, these species may have been originally introduced in the Neolithic period as game.

By the Bronze Age, the hare, cat, hedgehog, pygmy shrew, and house mouse had appeared. The hedgehog, mouse, and shrew may have come earlier, but they have not yet been identified from limited Neolithic samples. These small rodents were likely not introduced intentionally; they are vermin and pests to homes and crops. They would have arrived on ships transporting grains or other edibles. The Minoan period witnessed the first appearance of equids. Having horses and asses meant that people could travel farther and faster on the island and live inland as opposed to close to the shore, because of communication and trade among communities via equid transportation. Agriculture could expand accordingly.

During the Greek period, the rat first appears in faunal samples from the island, as well as other rodents. From Roman and medieval sites, there seems to have been an influx of rodents and mustelids to Crete. The weasel first appears in the faunal record at this time. The dormouse (*Glis glis*) exists in modern times on the island, but the period of its introduction cannot be ascertained owing to lack of information in the archaeological record. The Romans are notorious for their dormouse recipes, as recorded in Apicius; however, Rackham and Moody (1996) mention a Pleistocene dormouse in the faunal record of the island. If this is true, then the dormouse may very well be indigenous to the island. All mammals mentioned seem to thrive on Crete, with the exception of the deer, which was overhunted in the past centuries, leading to the extinction of the local cervid populations. The *agrími* is following the same fate, with only about 600 individuals living today on islets around the island and in the Samaria National Park. It is known that Cretan wedding feasts traditionally included deer or wild goat in the fare offered by the bride's parents to guests. Clearly, the number of weddings, and local sport, are partially responsible for the reduced numbers of these ancient creatures on the island, as is the clearing of forests to accommodate the growing human population. In the delicate balance between humans and nature, humans affect their landscape as much as the landscape affects them.

### Faunal Remains from the Southern Area at Kommos

The faunal remains from the Southern Area of excavations at Kommos represent a sample of animals available to or exploited by the local Minoan population.[84] The sample is not typical of a zooarchaeological town assemblage, for the Southern Area is not the residential area of Minoan Kommos. Rather, it is the civic area occupied by large administrative or industrial buildings. The faunal remains, as a consequence, have not been recovered from large domestic bone middens but from small dump sites. With the exception of House X, which will be published separately, the Southern Area contained predominantly public areas during the Minoan period. The houses of the Minoan town on the Hilltop and Hillside to the immediate north have been published in *Kommos* I, Parts 1 and 2, and the faunal remains from the town recovered during excavations of 1976–85 have been published by D. S. Reese (with contributions by M. J. Rose and S. Payne) in *Kommos* I, Part 1.

This report examines the animal and marine remains recovered from excavations conducted from 1990 to 1997 only. The faunal assemblages examined here originated from large Minoan buildings, specifically palatial structures AA from the MM IIB period and T from the MM III–LM II periods. The fauna from the LM IIIA2–B shipshed, Building P, and its associated "administrative" Building N are also presented. Bone and shell deposits predating the construction of AA are also examined. The present section is organized into six major parts: methods, general observations on the sample, a review of animal groups, a catalogue of the worked bone, discussions of specific issues concerning the marine remains discovered in the Southern Area, and an interpretation of space usage in the light of the faunal finds. The section includes tables listing the faunal remains from well-dated deposits from the site in correspondence with pottery groups defined by Rutter and Van de Moortel in this volume.

The overall faunal sample comprises predominantly marine remains, especially molluscs, but also includes crustaceans, echinoderms, and fishes. Bone remains were few and poorly preserved, mostly representing mammalian species with only a few avian and marine fish remains. Land molluscs were also present throughout the site. Bone and shell remains contemporary with the Minoan civic buildings in the Southern Area weigh 26.486 kg. Of the total weight of faunal remains, 22.246 kg is marine material, mostly molluscs, and only 4.250 kg is bone. The preservation of the marine and land snail shell is excellent mostly owing to the concentrated calcium carbonate composition, which resists deterioration in soil. The bone remains are poorly preserved by comparison because bone is generally more fragile in nature with its trabecular or spongy bone interior. Bones are broken primarily by human activities such as butchering and marrow extraction, then trampled over in antiquity, and finally subjected to soil erosion for over 3,000 years.

## Methods

All faunal material was washed to remove loose soil and clay concretions. Washing was necessary for basic identification and to observe surface preservation and possible signs of polishing, gnawing, or butchering marks. Washing and general cleaning also facilitated in measuring the sample weight as accurately as possible. Each bone collection from applicable pails was measured in grams. Separate weights for bone and shell were taken from each context.

The dimensions of complete bones, using the standard measurements published by von den Driesch (1976), and shells were recorded. Almost all bones were fragmentary and as a consequence offered no complete dimensions. Intact molluscs were measured in millimeters so that a range of sizes could be established for each species. Only one measurement was taken from each shell. For valves, length was measured from the umbo to the adjacent edge of the shell, and for vertically oriented gastropods, like *Monodonta*, the breadth of the largest body whorl was measured at the widest point. For gastropods with a horizontal orientation, as in *Murex*, *Euthria*, and *Cerithium*, length was measured from the apex to the end of the siphonal canal. Size can aid in determining the season in which the shells were gathered (Ham and Irvine 1975). Seasonality might be of interest when examining an archaeological deposit of shells such as a midden, a kitchen area, or a ritual deposit. Calculating the average weight of complete specimens in a shell assemblage can serve in calculating the approximate number of complete shells from fragments. The average weight is then divided into the total weight of the fragments. The resulting quotient provides a minimal approximation of the original number of molluscs in an assemblage. This method is useful particularly when dealing with shell middens, where the number of specimens can help determine the amount of meat extracted from the total accumulation.

The weight of the meat contained in a valve can be estimated by first filling the shell with water and weighing it (Shackleton 1969: 408). To estimate the meat weight for a symmetrical bivalve with equal-sized valves, like *Glycymeris*, two valves filled with water should be weighed, or one valve multiplied by two, and then the weight of the shell subtracted. For asymmetrical bivalves, such as *Pecten*, only the deepest valve should be filled and weighed for the meat estimate of the whole bivalve, minus the weight of the shell. For gastropods, water can be introduced through the aperture and then the whole weighed and the shell mass subtracted. Calculating approximate meat weight can then assist in reconstructing the event that led to the deposition of the midden, for example, estimating how many people might have dined on the snails found in it.

Ninety-nine percent of the marine remains assemblage from the site was shell. Examining and identifying marine molluscs is much easier than bone analysis simply because each species is different in texture and color, two physical characteristics that bones do not usually exhibit to help distinguish among species. Even highly fragmented shell is easily identified because texture and color can be maintained by fragments even through wear. For bivalves, hinge teeth are very diagnostic of species. Occurring on the edge under the umbo, the hinge is usually the thickest part of the shell and can withstand tremendous pressure before breaking or wearing down completely. Thus all shell fragments could be classified at least to genus level. The total number of shells retrieved from seven years of excavation in the Southern Area at Kommos totaled some 5,897 complete shells with a further 4,099 large fragments. Thousands (15,000+) of pea-sized fragments or smaller, mostly *Murex*, were also recovered. Counting fragments can offer clues about the function of shell as well. For example, the total number of *Murex* fragments strongly outnumbers the complete specimens. This characteristic of the sample suggests that the purpose of collecting *Murex* involved breaking the shell, in this case, to extract the dye gland in the creature. *Monodonta* were found usually intact, implying their use did not require breaking the shell, as in cooking and then eating the creature within, or collecting the shell as ornament. Studying fragmentation and preservation of faunal material can also help in assessing the function of the area in which they were recovered. For example, fauna recovered from a dump site will likely be better preserved than remains found on a road or in a courtyard. Fragmentation of fauna can suggest, therefore, traffic in a certain area or the taphonomic history of the bones and shells themselves.

The bone remains were scrappy at best. The age and wear of the bones from traffic, exposure, and erosion rendered the sample small and fragmentary. Only 63 complete bones and teeth, mostly phalanges and molars, and 563 other fragments were found in the whole area during seven years of excavation, despite sieving. Not a single long bone or trunk element was found intact. Even proximal and distal ends of long bones were highly fragmentary, making the task of identification tricky at times, especially when distinguishing between sheep and goat remains. Most sheep and goat distinctions were made cautiously from phalanges (Boessneck, Müller, and Teichert 1964; Wasse 1999). A few other distinctions were noted from bits of crania and horn core, and others from fragmentary distal humeri and metapodials (Payne 1969). The individuals were aged on the basis of epiphysial fusion and tooth eruption (Silver 1969), and sexed when applicable (Ruscillo 2000). In cases where other identifiable bone elements from medium-sized bovids were too fragmentary for further taxonomic identification, the common classification of *Ovis/Capra* (O/C) was assigned. Each bone was examined for traces of burning or butchery. The minimum number of individuals (MNI) was calculated for each applicable species. The MNI is a standard zooarchaeological method of siding and counting the most common bone element in an assemblage for any given species. Because sided elements occur only once in a single skeleton, for example, left femur, a count of each element will reveal the most commonly occurring bone, thus providing an index of the least number of possible individuals for each species represented in a sample.

Most unidentifiable scraps of bone could be classified as mammalian, avian, or marine, although only five bird and six fish remains were recovered. The limited number of bones combined with their fragmentary state is a reflection of the contexts in which they were recovered. As already mentioned, this sample was produced from the public area of the Minoan town rather than from the domestic area, where meal refuse was commonly found in association with the houses. Food consumption only occasionally occurs in civic centers, let alone dumping. Dining may very well have been a common occurrence in the earlier buildings AA and T, but the refuse contemporary with these buildings may have been dumped well away from the buildings, or later construction may have destroyed these faunal remains. The sheer size of the buildings in the Southern Area indicates the amount of dirt moved and heavy weights transported over the land in the immediate area. Exposed bone remains could easily have been crushed by this amount of traffic.

Microfauna were recovered by soil sieving through a 2-mm mesh, although they were almost exclusively recovered in association with House X deposits, which are to be published separately. Faunal remains recovered through sieving techniques were emptied onto a flat tray and sorted by species. The shell and bone remains were weighed separately and recorded noting the number of fragments of each species. This recording was done for each context where soil sieving was performed. Sieving techniques increased the recovery of small and fragile fauna significantly. For example, 63% of urchin remains, consisting of spine and test pieces, were retrieved through soil sieving. Two species of marine shell reported from this sample were identified solely from sieved material; these representatives would not have been recovered were it not for soil sieving.

Unique bones or shells exhibiting rare or interesting qualities from interesting contexts were catalogued in the main Kommos cataloguing system and assigned a "Bo" number for bone, or "Sh" number for shell for future reference.

## General Observations

Species represented in the faunal sample from the Southern Area at Kommos are listed in Table 4.7. The species are listed in phylogenetic order beginning with fossil invertebrates and ending with mammals.

The greatest variety of animals occurred in the class marine invertebrates. Within this class, molluscs exhibited the most diverse array of species. This finding is common to archaeological sites located near shorelines. Molluscs are readily available by the sea, either alive in the sublittoral shore or dead on the beach. Besides their availability, they are very durable taphonomically.

Table 4.7. Species in the faunal sample from the Southern Area.

| Marine Invertebrates | |
|---|---|
| **Fossils** | |
| | Oyster |
| | Scallop |
| | Urchin |
| **Mollusca** | |
| *Acanthocardia tuberculatum* | Spiny cockle |
| *Arca noae* | Ark shell |
| *Arcularia gibbosula* | Southern Mediterranean nassa |
| *Astraea rugosa* | Star shell |
| *Bittium reticulatum* | Needle shell |
| *Cassis sulcosa* | Helmet shell |
| *Cerastoderma edule* | Common cockle |
| *Cerastoderma glaucum* | Greenish edible cockle |
| *Cerithium vulgatum* | Common horn shell |
| *Charonia tritonis sequenzae* | Triton shell |
| *Chlamys varia* | Variegated scallop |
| *Columbella rustica* | Dove shell |
| *Conus mediterraneus* | Mediterranean cone shell |
| *Cypraea lurida* | Lurid cowrie |
| *Cypraea pyrum* | Pear cowrie |
| *Dentalium vulgare* | Tusk shell |
| *Donax trunculus* | Wedge shell |
| *Euthria corneum* | Spindle euthria |
| *Fascularia lignaria* | Whelk |
| *Gibbula albida* | Top shell |
| *Glycymeris violacescens* | Violet dog cockle |
| *Mactra corallina* | Surf shell |
| *Monodonta turbinata* | Toothed top shell |
| *Murex brandaris* | Dye murex |
| *Murex trunculus* | Trunk murex |
| *Nerita* sp. | Nerite shell |
| *Ostrea edulis* | Common oyster |
| *Patella caerulea* | Mediterranean limpet |
| *Patella lusitanica* | Limpet |
| *Pinna nobilis* | Fan mussel |
| *Pisania maculosa* | Pisania shell |
| *Sepia* sp. | Cuttlefish |

| Marine Invertebrates | |
|---|---|
| *Spondylus gaederopus* | Thorny oyster |
| *Tonna galea* | Giant tun shell |
| *Thais haematostoma* | Rock shell |
| *Vermetus triqueter* | Worm shell |
| **Crustaceans** | |
| *Eriphia spinifrons* | Yellow crab |
| **Echinoderms** | |
| *Paracentrotus lividus* | Rock urchin |
| **Marine Vertebrates** | |
| **Fishes** | |
| cf. *Gaidropsarus mediterraneus* | Shore rockling |
| *Diplodus* sp. | Sea bream |
| **Land Invertebrates** | |
| **Mollusca** | |
| *Clausilia cruciata* | |
| *Cochlicella* sp. | |
| *Eobania vermiculata* | |
| *Helicella* spp. | |
| *Helix aperta* | |
| *Helix aspersa* | |
| *Helix melanostoma* | |
| *Oxychilus* sp. | |
| *Rumina decollata* | |
| **Land Vertebrates** | |
| **Aves** | |
| | At least two species |
| **Mammalia** | |
| *Bos taurus* | Cattle |
| *Canis familiaris* | Dog |
| *Capra hircus* | Goat |
| *Capreolus capreolus?* | Roe deer |
| *Dama dama* | Fallow deer |
| *Ovis aries* | Sheep |
| *Sus scrofa* | Pig |

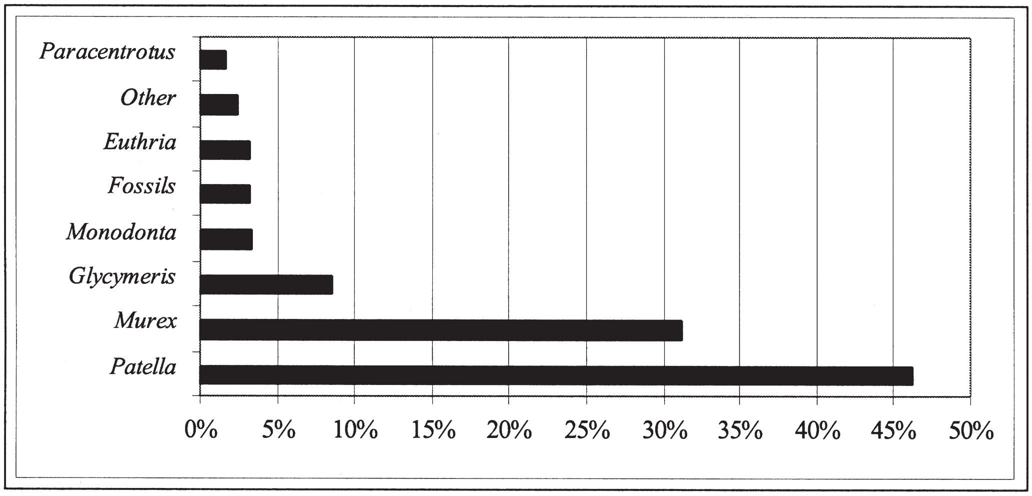


Figure 4.1. Summary of marine invertebrates from the Minoan period recovered from excavations in the Southern Area at Kommos, 1990–97.

Figure 4.1 summarizes the marine invertebrates from the Kommos sample. Limpets made up almost half (46.3%, or 3,460 shells with 564 fragments) of the invertebrate marine sample from the Southern Area. Thousands of limpets (30,457) were recovered from the Hilltop and Central Hillside excavations at Kommos, as recorded by Reese (1995d). From the Southern Area in Minoan levels from excavations prior to 1985 in the area, Reese counted 4,188 *Patella*. Together with another 3,459 from recent excavations, the sum of 7,647 limpets is a considerable number of shells, especially since the entire settled area has not been excavated.

*Murex* shells (31.2%, or 684 specimens with 2,033 large fragments) were commonly found on the site particularly in concentrations from certain areas, specifically around the South Stoa of Buildings AA and T. The statistics presented here for marine invertebrates do not include the thousands of tiny *Murex* pieces gathered also from excavations (15,000+). The crushed remains of *Murex* are typical of refuse from dye-extraction techniques from the MM period discussed at length below. Excavations around the North Stoa have revealed calcined *Murex* concentrations *in situ* as lime made into a plaster surface or packing of the Central Court associated with Building AA in the MM II period, perhaps as a secondary use of the dye extraction refuse.

*Glycymeris* make up 8.5% (393 and 343 fragments) of the marine sample, with waterworn shells recovered from all areas of the southern excavations. Collected dead, these shells present an enigma; the rationale for collecting them, particularly in the LM IIIA period, is not clear.

*Euthria* and *Monodonta* are equally represented in the BA shell sample with 3.2 and 3.4% of the sample, respectively. The former was found associated with crushed *Murex*, probably collected unintentionally with baited or hand-collected specimens (see "*Murex* Dye Production" in this section). *Monodonta* were likely exploited for food purposes or as ornaments.

*Paracentrotus* or urchins were found in a very fragmentary state owing to the brittleness of their spines and test pieces. Urchins, like fish in this sample, were underrepresented in the sample owing to the fragile nature of their remains. Although fish and urchin specimens were very scarce, it is believed that these creatures were a significant part of the Minoan diet. Evidence extends to fishing hooks found from the excavations at Kommos, and iconographic representations from Minoan Crete (see rhyton from Knossos with urchin and whelks, Evans 1964 [reprint]: vol. II, fig. 312B). A good variety of other sea creatures are represented on site indicating the close relationship the BA inhabitants had with the sea, not only for food but also for industry and ornament. Octopus, squid, cuttlefish, and other animals must have been exploited as well. Excavations from the Minoan town site on the Hilltop and Hillside at Kommos recovered the remains of at least 20 different types of fish including topes, groupers, breams, wrasses, and tunny. The fish remains from there were studied and published in *Kommos* I, Part 1, by Rose. (For the IA remains from the Greek period, see Rose in *Kommos* IV, Part 1.) The recovery of the fish assemblage from the town supports the significance of seafood in the diet of the inhabitants at Kommos.

Fossil marine invertebrates such as oysters, scallops, urchins, and gastropods were recovered at the site. These finds are usually deposited geologically rather than as a result of human activity. These petrified invertebrates come from the local fossiliferous limestone (M. D. Higgins and R. A. Higgins 1996: 206). This formation, including the underlying Neogene marl, dates to the Upper Miocene period from the Tortonian or Messinian Age (7–9 million years ago) (Gifford 1995), well before *Homo sapiens* walked the earth. It is possible, however, that fossils were collected and kept by Minoans, much as we collect them today. For example, six fossil oysters from the town site preserve the remains of hematite within them (Reese 1995a: 87). It is possible that people may have used these sometimes large shells as palettes for storing or using hematite as paint or cosmetics.

The "Other" category includes 28 other species of marine remains. These species are represented by fewer than ten complete specimens, although it should not be assumed that these species are less important. Crab, cuttlefish remains, and other fragile shells are included in this category and are underrepresented partially owing to poor preservation. Other specimens in this group that are more sturdy, such as *Arca*, *Arcularia*, *Bittium*, *Cerithium*, *Pisania*, and *Spondylus*, are rarer to find along the Kommos shoreline. These species are not traditionally known for their food value, with the exception of *Arca* shells, whose bitter meat is still edible. *Arcularia* and *Pisania*, however, are pretty and hence could have been sought as ornaments. *Cerithium* is commonly used as fish bait. Although not found in great numbers at the site, these species, exploited for ornamentation, bait, and perhaps other more obscure uses, suggest the resourcefulness of those who collected them and thus benefited from even the most minuscule of natural resources in the area.

Vertebrate animals were scanty (63 bones and 563 fragments) in comparison with the marine sample. A summary of bone remains is illustrated in Figure 4.2 to characterize the vertebrate assemblage. Unidentifiable bone remains make up 35% (219 fragments) of the bone

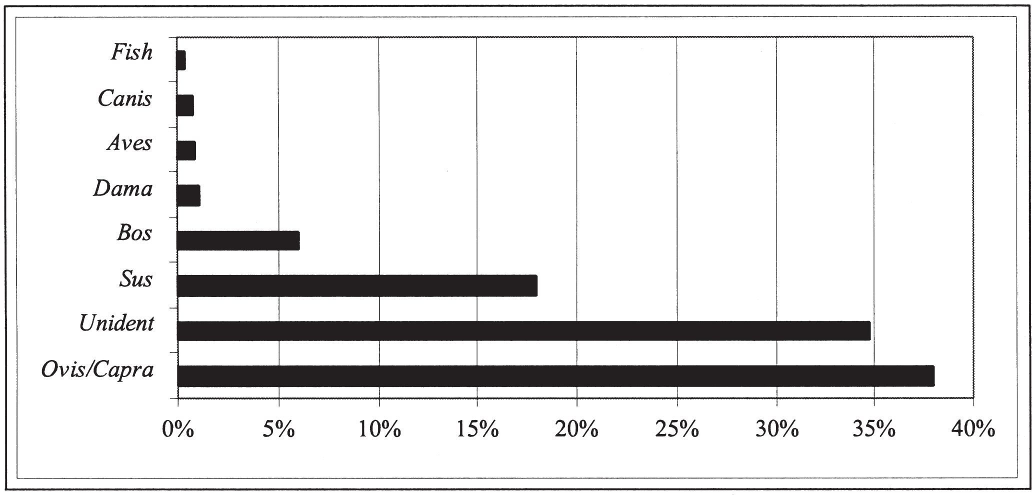


Figure 4.2. Summary of animal bone remains from the Minoan period recovered from excavations in the Southern Area at Kommos, 1990–97.

sample, although these bone slivers can be confidently classified as mammalian. Deer (1.1%) includes both *Dama dama* (fallow deer) species and one suspected *Capreolus capreolus* (roe deer), the latter represented by just two bones.

Fish and avian remains were few, probably reflecting the nondomestic nature of the Southern Area of the site, as well as their fragile character. Judging from the poor preservation of the stronger mammalian bones, the avian and marine vertebrate remains had little chance for survival. These orders of animals are better represented in earlier excavation of the domestic areas of the Hilltop and Central Hillside of Kommos. See D. S. Reese (chap. 5.3) in *Kommos* I, Part 1, and M. J. Rose (chap. 5.4) in the same volume for discussion of more extensive remains from bird and fish groups recovered from the Kommos excavations (1976–85). Micromammals are not presented in this chapter, but a good discussion of small mammals from the town site by Payne (app. 5.1) appears in *Kommos* I, Part 1.

Sheep and goat remains make up at least 38% (238 bones) of the entire bone sample. Sheep and goat distinctions could be made on only 6% (14 bones) of this collection, showing a slight bias toward goat remains. The bones, however, were too few to adequately reflect bovine herding practices of the Minoans at Kommos. Analysis showed that both sheep and goat were husbanded during the MM and LM periods at Kommos.

Pig bones are common in the sample. These, too, are highly fragmented but can be assumed to have come from domesticated animals such as those introduced to Crete in the Aceramic Neolithic period. Large tusks recovered could represent hunted individuals from a feral population, perhaps established from escapees from original herds. Pig made up at least 18% (113 bones) of the sample.

Fragments of cattle bones recovered from the recent excavations produced at least 6% (38 bones) of the sample. One head of cattle can produce four times more meat than a single

Table 4.8. Date distribution of mammal bone sample.

| Date of context | Percentage of sample |
|---|---|
| MM IB | 13.7 |
| MM IB–II | 13.2 |
| MM III–LM I | 6.5 |
| MM IB–LM IA | 10.4 |
| LM I | 1.7 |
| LM II | 1.3 |
| LM III | 13.2 |
| LM IA–IIIA2/B | 19.3 |
| Mixed Minoan | 20.7 |

sheep, so the fact that the remains are few should not detract from the possible importance of beef in the Minoan diet. Cattle were probably used for traction as well, although stress indicators on bones have been not been identified. The absence of equids in this sample further suggests that cattle were used as draft animals. The *Bos* remains are all bones of adult specimens (4+ years), supporting the traction hypothesis; meat animals are generally consumed at a younger age.

A few dog bones were also present, contributing less than 1% (4 bones) of the bone sample recovered from recent excavations.

## Mammals

There are limitations on what can be said about the mammal bones from the civic buildings at Kommos. Only 4.250 kg or 615 bones and bone pieces were recovered from this area, only 65% of which were identifiable to genus and species; however, the bones can indicate the presence of certain species at specific periods or in special deposits. Bones and shells deriving from securely dated deposits are listed in Tables 4.13, 4.14, and 4.15 in accordance with the ceramic groups established by Van de Moortel and Rutter (Chap. 3). Reese studied a larger sample (9,441 bones) from the domestic quarters of the settlement, which is more representative of the diet and economy of Minoan Kommos (Reese 1995b: 165–94). The mammal bone sample from the Hillside and Hilltop of the site included hares, equids, mustelids, mice, and shrews in addition to the species identified here from the Civic Center. Hares, equids, mustelids, and small rodents were recovered from House X from the Southern Area of the site as well, which are to be published separately. The mammal bones from the civic area are grouped in Table 4.8 by date of context.

LM I bones are underrepresented in the sample because they occur mostly in mixed contexts, particularly with earlier MM material. Bones from LM II levels were heavily mixed with later material. Only one MM III pure context containing two cattle molars was identified

(81B/240 in P3). One-fifth of the sample was from mixed Minoan levels (EM II–LM IIIA2). Almost 27% of the bones came from periods prior to the building of AA in the MM IIB period, and about 17% were contemporary with the use of AA and T. Bones dating to the use of P represented approximately 20% of the sample. Notable finds and contexts are discussed in the following sections organized by mammal group.

### CANIDS

Only four bone fragments of dog were recovered from this species of animal. Domestic dog remains (*Canis familiaris*) represent one individual by MNI count, but spatial and chronological examination of the finds revealed that the bones are likely remains of two or three individuals. All appear to be from adult medium-sized dogs. Two bones, a mandible fragment and a proximal phalanx, were recovered from the east of the back wall of Building T/P. These two bones date to LM IIIA according to pottery recovered with them and could be remains from the same individual. An articular rib fragment was discovered in the proximity of the southeast corner of T and was dated to the MM II–LM IB periods. A vertebral fragment from directly east of Building T/P is contemporary with the rib but was found approximately 50 m away and could represent a third individual; however, the rib and vertebral fragments could plausibly be from the same dog as well. Crushed and burnt *Murex* from MM IB/II was found in a large concentration in the same area as the rib fragment in the southeast corner of T. The only other place that *Murex* from the same date and preservation occurred was east of T/P from the same trench as the vertebral fragment (88A). It is plausible, then, to suggest that when earth was moved during the building of T or P, parts of the same dog were shifted, along with the earth and *Murex* pieces. The LM IA pottery kiln dump, found in the southeast corner of T, contained pieces of pottery that had joins found in the same area east of T/P (Van de Moortel Chap. 3.2). The earth was shifted during the construction of later buildings, and the dirt with its inclusions was secondarily deposited to the east of T/P, possibly redistributing parts of the same dog in the process.

The dog was one of the original domesticated animals introduced to Crete in the Aceramic Neolithic (Jarman 1996). Since that time, dog remains have appeared commonly at archaeological sites on Crete in all periods, both Prehistoric and Historic. Dogs were likely brought in with the first settlers to protect and attend herds, provide companionship, and help in the hunt. There is evidence, however, that dogs at Dark Age Vronda were eaten (Snyder and Klippel 1991). No evidence of canid consumption has been found from Minoan Crete.

### SUIDS

Of the total sample, 18% or 113 fragments were pig bones. Pig remains were the second most common mammal group recovered. Thirty-four percent (39) of the bones were from pure MM IB contexts, and a further 22% from mixed MM contexts. Another 36% were from mixed MM and LM contexts. The remaining 8% were from LM IIIA levels. It is not clear from this

Table 4.9. Summary of suid remains from the Southern Area.

| Skeletal part | Percentage of sample |
|---|---|
| Cranium/mandible | 29 |
| Teeth | 29 |
| Trunk elements | 6 |
| Anterior extremities | 11 |
| Posterior extremities | 13 |
| Metapodials/phalanges | 12 |

sample whether pigs were hunted from feral populations or domesticated, because the remains are very fragmentary. Examination of the age range of the suid remains from the MM IB period indicated that there were remains of at least one juvenile individual, (an) individual(s) under 10 months, at least one around 17 months, a few over 3.5 years, and (an) old individual(s) over six years (6 MNI). From the variety of ages, one might argue that these pigs were hunted rather than domesticated, because no culling strategy or pattern regarding age is revealed. Unlike sheep or goats, pigs are not typically herded for their skin or milk, so one might expect a more regular culling pattern of age for domestic pigs in a meat economy. Notable was the discovery of a large male canine recovered from recent excavations, and Reese also reports one large unworn molar of a male, which could represent a wild boar from MM IB (Reese 1995b: 179). Male pigs are not usually herded owing to their fierce temperament, but they can be castrated, or one or two individuals may be kept for breeding purposes. Yet, Kommos has produced a couple of adult male individuals, even in this small sample size. Although pigs are known to have been domesticated on Crete since the Aceramic Neolithic, a feral population could easily have been established by lost or escaped individuals. Hunting feral pigs would explain the irregular culling ages found in the sample, albeit small, and the presence of large males. Table 4.9 summarizes the skeletal elements representing suids.

The distribution of bone elements from suids appears regular; all elements from the skeleton are represented. Interesting to note, however, is the paucity of trunk elements. The trunk of the skeleton includes the vertebrae (axis, atlas, cervical, thoracic, lumbar, sacral, caudal), ribs, and sternum. A skeleton of a pig, for example, contains over thirty vertebrae. Typical butchering techniques in antiquity and modern times involved splitting the carcass along the dorsolongitudinal plane, which would create at least 50 pieces of split large and smaller whole vertebrae from each skeleton. Yet, in the sample from the recent excavations, only one rib fragment and six vertebral pieces were recovered. One might expect at least twice that number in proportion to the other bones recovered. One lumbar (or lower back) vertebra was found butchered down the center—evidence that typical butchering techniques were practiced at Kommos. The underrepresentation of trunk elements could then likely be attributed to the fragile state of the vertebrae and ribs in general. Vertebrae have dorsal and lateral processes, or long, thin pieces of bones extending from the center of the vertebra (centrum), which are fragile and break easily. These processes make the whole bone vulnerable to breakage in many pieces. Ribs are long and thin, especially toward the ventral end. Another explanation is that the pork loin cuts, which are the choicest parts of a pig, were taken and disposed of elsewhere. Pork loin is cut from the center of the back between the shoulder and the pelvis.

Cranial and teeth fragments make up almost 60% of the suid sample. The pig cranium is larger and very sturdy in comparison with those of other mammals, which accounts for the adequate representation of cranial material. Teeth also survive better in the ground because of their protective enamel coating. There are 44 teeth in one adult pig mouth, so increased frequency of these elements is normal. In this sample, 9 complete teeth were found and 22 fragments. No juvenile teeth were recovered, but an erupting incisor (less than 20 months old) and two erupting molar fragments (less than 13 months old) represent immature individuals. All other teeth are fully erupted, including four worn old adult teeth (two incisors, two molars).

### CERVIDS

Deer remains are few, making up only 1.1% of the bone assemblage. The faunal sample from Kommos contains seven cervid bone fragments, six of which are of *Dama dama*, or fallow deer. The seventh cervid bone is a left glenoid that could possibly be from *Capreolus capreolus*, or roe deer, from the MM IB period. This smaller deer has been identified elsewhere on Crete. *Capreolus* remains have been reported from Knossos in the MM III Western Repository (Evans 1964 [reprint]: vol. I, 496), from Neolithic Phaistos (Hutchinson 1962: 238), and from Chania (Reese 1995b: 191). Roe deer remains, however, are difficult to identify because this animal is roughly the same size as a domestic sheep. Although the legs are more gracile and longer, most fragments from the skeleton are very difficult to discern. *Dama*, on the other hand, is well known from the Greek Mainland and the islands. On Crete, fallow deer has been identified from Minoan levels and the Dark Age at Knossos (Jarman 1996), at the Dictean Cave (Boyd-Dawkins 1902), and at Vronda (Snyder and Klippel 1991).

The coexistence of both species of deer, and even a third, *Cervus elaphus*, reported from Knossos (Jarman 1996) and Chania (Persson and Persson 2000) on Crete is unlikely. Unless individuals were brought in during separate events, the resources and range limits on an island are far too restricted to support three cervid species for an extended period. Shay and Shay (1995) and Gifford (1995) state in their analyses, however, that topographic and botanical evidence from the Kommos area support the presence of a more lush forested environment in the Minoan era. Deer could easily have existed on the island with more forest cover—perhaps more than one species.

Five bones of *Dama* were found in the same area and represent different elements of the skeleton, so these remains could likely be from the same individual. The remains are from

Table 4.10. Summary of sheep and goat remains from the Southern Area.

| Skeletal Part | Percentage of Sample |
|---|---|
| Cranium/mandible | 11 |
| Teeth | 30 |
| Trunk elements | 13 |
| Anterior extremities | 22 |
| Posterior extremities | 18 |
| Phalanges | 6 |

an individual(s) greater than four years of age. The bones date from the MM IB/II period and were recovered from the area east of Building T/P. A sixth bone from a fallow deer was found in the middle of the third gallery of P with a date of LM IIIA2/B–eighth century B.C. This bone probably represents a second individual.

### BOVIDS

Sheep and goat remains are prominent in the faunal sample and contribute more than a third of the specimens in the bone sample. Approximately 1.5 kg of sheep and goat bones was recovered from the site. Only 6% (14 specimens) of these bones could be distinguished as either sheep or goat. Phalanges and bits of horncore were used to separate sheep from goat bones, although a few distinctions were made from fragments of longbone ends, such as the distal humerus and distal metacarpal. Table 4.10 summarizes the sheep and goat elements preserved in the sample.

The bone elements represented in sheep and goat skeletons from the site are regularly distributed. Typical of bovid remains is the large number of teeth recovered. The reason for this is threefold. First, the mandible does not have a lot of meat; the tongue of the sheep or goat is usually taken out, but the mandible with its teeth is usually left intact. The teeth are not usually affected by the butchering of the carcass. Second, the teeth are covered in a layer of hard enamel, which protects the bone from decay; often, teeth are better preserved than skeletal elements after exposure to the same taphonomic processes. Third, a single mouth can contain 40 teeth. If one found the remains of two sheep, for example, one would have potentially 80 teeth preserved. Therefore, finding many teeth is not unusual. Phalanges, or bones of the hoof, too, are fairly sturdy, as they are compact and dense for their size in proportion to the larger longbones. Phalanges do not offer much meat and are usually discarded during the primary butchering of the carcass. A bovid skeleton has 24 phalanges, so one would expect to find more in archaeological bone samples. Because they are discarded during primary butchering, phalanges are not often thrown in the same dump as the rest of the carcass that has been eaten. The bone sample from the Southern Area at Kommos contained six proximal phalanges from goat and one from sheep, plus four more fragments of other phalanges. There were no distal phalanges recovered, only proximal and medial.

The lack of trunk fragments is similar to the situation witnessed with the suid remains. Again, the underrepresentation of vertebrae and ribs is partly due to fragility. The only butchered bone found from the sheep and goat bones was a cervical (or neck) vertebra split down the middle. If the carcasses were split down the spine, the vertebrae would become even more fragile, affecting preservation. Unlike pigs, bovids do not carry choice meat along their dorsal plane. Meat on vertebrae and ribs is scarce but tasty (παϊδάκια). In any case, the whole skeleton would unlikely be butchered, consumed, and discarded all in the same location. The trunk portions of the carcasses could have been moved to another area of the site for consumption. Since the Southern Area is predominantly a public area, parts of the animals were likely consumed in the domestic quarters on the Hilltop and the Hillside.

Posterior and anterior longbones are roughly equal in number, with a slight bias in the amount of anterior elements in the sample. The longbones, particularly those that occur closest to the spine in the skeleton, such as the humerus and femur, are the most meat-bearing of all the bones. They also contain the most bone marrow. To extract bone marrow the bone must be broken. Marrow contains a high concentration of protein and is considered, even today in some cultures, one of the most desirable parts of the skeleton. Thus, bone is usually discarded in pieces. The longbone fragments from the Southern Area were shattered, more so than from simple marrow extraction. The poor state suggests major taphonomic factors affecting this bone sample, especially compounded with the age of the bones, spanning some 3,000 years. Approximately 25% of the sheep and goat remains came from the MM IB–II periods, and almost 58% from the MM IB–LM IB periods, which would establish an age for the bones of 3,900 years at the most. These bones would have been subjected to almost 4,000 years of soil acidity and perhaps the elements of climate such as sun and rain as well. The Civic Center would have been a high-traffic area after the MM II period, so some bones would have been trampled quite a bit.

Cranial pieces were few, but this is to be expected, as the cranium is thin and usually broken to extract the highly favored brain. Only two pieces of horncore were recovered, one belonging to *Ovis* and the other to *Capra*. Another cranial piece was found diagnostic of *Ovis* by the angle of the *sutura frontoparietalis* (Boessneck, Müller, and Teichert 1964; Prummel and Frisch 1986).

There are at least 239 sheep/goat bones and teeth in the total faunal sample. Within this group, 14 bones are from juvenile sheep or goat, 3 bones are from individuals less than a year old, 3 other bones are from individuals less than three and a half years old, 4 are from individuals less than four years old, and 6 bones are from old adult bovids. From bone counts of same-sided elements, the number of individuals represented in the whole sample is three juveniles, one at under three and a half years, and eight at immature or older. These figures are estimated including spatial and temporal distribution around the Southern Area

Table 4.11. Summary of chronological distribution of the sheep and goat remains.

| Date of context | Percentage of sample |
|---|---|
| MM IB | 16 |
| MM IB–II | 9.2 |
| MM IB–LM IB | 32.5 |
| LM IA–IIIA2/B | 6.8 |
| Mixed Minoan | 35.5 |

of the site. The total estimate of MNI for medium bovids at the site is twelve individuals, but this is only the smallest number of individuals the bones represent. One could also argue that each bone represents a different individual, in which case there would be a maximum of 239 medium-sized bovids represented in the site sample from the Southern Area. Table 4.11 summarizes the sheep and goat remains chronologically.

As to the chronology of the bovid finds, few contexts were pure. The majority of the sample (57.7%) was recovered from pre–LM IB levels. The only specific date found for sheep and goat remains was MM IB; the rest were unfortunately mixed. These statistics again reflect the activity on the site after MM IB. Massive building projects were undertaken in the Southern Area after this date, resulting in a mix of earlier Minoan finds. Building during the Historic period further complicated stratigraphy and interpretation of the bone material. What can be said is that sheep as well as goat were herded in Kommos at least from the MM IB period, although Reese identified five sheep/goat bones as early as EM II–III from the Central Hillside, Room 33 (Reese 1995b: 168).

There are few cattle bones in the sample. Only eight bones, comprising teeth and phalanges, were recovered, as well as thirty other fragments. All parts of the skeleton seem to be represented. Three bone specimens are less than three and a half years old, and three others are molars from old adults, identified by the substantial wear on the teeth. Only one proximal femur was found to exhibit butchering marks from a metal knife. The minimum number of individuals (MNI) represented in this sample is three. Since a specific bone does not occur more than once in this sample, the MNI was calculated on the basis of age groups. In this sample, there do appear to be three distinct age groups, old adult, immature or older, and under three and a half years. Juvenile bones of *Bos* are not present. Examination of the spatial distribution and date of the cattle remains suggested that the bones are more likely to represent six or more individuals. Of the total number of cattle bones, 50% came from MM IB–III levels, 26% originated in mixed MM III–LM IIIA levels, and 24% from LM IIIA levels.

The presence of bone remains from individual(s) with an age of less than three and a half years suggests that cattle could have been raised for meat, but the older individuals suggest the use of cattle as draft animals or for milk production. The sample is far too small to speculate on the patterns or strategy of cattle herding.

### DISCUSSION OF BONE REMAINS

Much of the bone material from Kommos was recovered from the MM IB period. This period predates even the earliest of the civic buildings in the Southern Area (Building AA constructed in the MM IIB period). From examining the animal remains, one can suggest that the area from which they came was used primarily for corralling animals or for industrial use like butchering and/or bone and leather working. Most of the bone remains are contemporary with the first building phase on the Central Hillside in the MM IB period, evidence for which comes from excavation of the East Building (Wright and McEnroe 1996). Reese reports a major accumulation of mammal bone fragments from this period in Room 33 of the East Building (Reese 1995b: 168). Three MM IB dumps excavated from the Lower Hillside on the northern edge of the Southern Area (Trench 11A below House X; Trench 28B, Spaces 26–27; Trench 20B east of the Round Building) comprised mostly domestic debris (Betancourt 1990). Betancourt suggests that the settlement likely expanded during the MM IB period (Betancourt 1990: 28). Domesticated animals identified from these dumps include dog, sheep/goat, cattle, and pig, all of which species would have helped support the growing population. The faunal remains recovered from excavations in the Southern Area are likely MM IB dumps associated with settlement on the hillside that were disturbed and scattered during later construction in the southern portion of the site.

The number of bone remains recovered from the Southern Area decreases for the LM period probably owing to the change in nature of the use of the Southern Area from land associated with domestic architecture to a Civic Center.

## WORKED BONE

There are three pieces of worked bone from the excavations of the civic buildings at Kommos.

**1** (Bo 60, 86D/52). Worked bone tool. Pl. 4.48 at *a*. MM IB–II, under floor of P3. Broken whittled piece of bone of two joining fragments. Max length 53 mm, max w 13 mm. Worked *Ovis*/*Capra* tibia shaft whittled into a blunt point. Concave interior worked into a smooth edge suggesting its use as a spoon, scraper, or auger. Broken at opposite end.

**2** (Bo 61, 88A/37). Worked bone point. Pl. 4.48 at *b*. MM II–LM I, east of T. One fragment preserving point, broken at opposite end. Max pres length 74 mm, max w 19 mm. *Ovis* proximal metatarsal piece with shaft whittled into a point. Polished surface.

**3** (Bo 62, 83A/54). Figure-of-eight piece with polished plaster surface. Pl. 4.48 at *c*. LM I–IIIA, under floor of P3. One fragment apparently intact. Max length 21 mm, max w 15 mm. Worked pendant or piece of inlay in the figure-of-eight shape with polished plaster surface on one side (not tooth enamel; scratches off and reacts to acid). Perhaps a worked piece of antler, as suggested by the longitudinal striations on the reverse side.

These worked pieces of bone represent a bone-working industry at Kommos between the MM IB and LM IIIA periods. They also show the resourcefulness of the inhabitants: Two types of tools and a decorative piece from only three examples of worked bone demonstrate the flexibility and ingenuity of the locals in the use of available resources. Bo 60 and Bo 61 may be leather-working tools, the former a scraper to separate hide from leg bones, and the latter to make holes for stitching skins together. The decorative piece (Bo 62) could have been inlaid in a worked piece of wooden furniture or may have been part of a piece of jewellery.

The bone point and spatulate "scraper" have parallels from the Minoan town site at Kommos. Thirty worked bone pieces were catalogued, including flat, thin points; thick, rounded points; spatulate implements; needles; and sheaths (Blitzer 1995: 497–500). Many tools dated to the LM II period, although a few from MM IB, LM IA, and LM IIIA2 were identified as well.

### Marine and Land Invertebrates

A total of 5,897 complete shells and 4,099 large fragments describe the marine remains sample from recent excavations at Kommos. Thousands (15,000+) of pea-sized fragments or smaller, mostly *Murex*, were also recovered. There were 35 species of marine molluscs identified, as listed previously, and nine species of land molluscs. Only five genera of marine shells occur frequently. The other 28 species, constituting only 3.2% of the sample, are represented by fewer than 20 individuals for each species. Because the remains from these 28 species are so infrequent (between one to five specimens) in the Southern Area at Kommos, a species-to-species account of remains and their possible meaning or significance would be somewhat contrived. These remains do not occur in any meaningful context in the Southern Area, although these species may very well have been collected as ornaments, parts of jewellery, gaming pieces, or ritual items. This section examines the more frequently occurring shells and their implications on the environment from which they were gathered and their impact on Minoan daily life.

Shells of frequent occurrence from recent excavations are as follows, listed in order of total number of specimens: *Patella* (3,460 valves and 565 fragments), *Murex* (684 shells, 2,033 large plus 15,000+ small fragments), *Glycymeris* (393 valves, 343 fragments), *Euthria* (188 shells, 91 fragments), and *Monodonta* (184 shells, 115 fragments). The *Helix* genera of land snails were, by far, the most common land mollusc, with 449 complete shells and 231 fragments. Examining these species more closely can reveal information not only about the people who deposited them but also about the environment and the archaeological stratigraphy from which they came, to be discussed below.

Tens of thousands of *Patella* shells, or limpets, were found in various locations around the site from earlier and more recent excavations. The shells were originally collected fresh from the sea and are likely the refuse of meals. At Kommos, there are two species of limpet, *Patella* *lusitanica* and *P. caerulea*. Both species seem to cohabit quite well in the same environment and can often be found adhering to the same rock in sublittoral waters. Because they must resist rough wave action, limpets are mostly muscle and as a result are very tough to chew. Nevertheless, *Patella* are a reliable food source supplying protein and a bit of calcium (Townsend 1967). One need go to only one semisubmerged sea rock to retrieve dozens. At Kommos, limpets are still found on the Papadóplaka and on the submerged rocks of the cliff south of site.

A notable concentration of limpets was exposed within the South Stoa (Trenches 95A and 95C). The assemblage contributed 55% (1,885 valves and 420 fragments) of the total limpets from excavations in the Southern Area with a date of MM III–LM IA. It is probable that this concentration postdates the use of the stoa in the Neopalatial period in early LM IA, since it is unlikely that food refuse was discarded in the stoa during its use. The concentration then predates, or is contemporary with, the construction and use of the pottery kiln built within the South Stoa during late LM IA. Limpets were not found directly around the kiln, only in the area directly west of it. The contextual evidence suggests that either the limpets were eaten when the kiln was being used and discarded nearby, or that the limpet concentration was spread underneath the stoa floor but dug out during the kiln's construction.

*Monodonta* contributed 3.4% of the shell sample from MM IB/II and LM IIIA2 periods with some from mixed LM/Historic levels. Concentrations of more than 20 specimens were not found, although 66 specimens were recovered in four groups of 19 or fewer in association with Gallery P3 from the LM IIIA2/B period. Perhaps these specimens had attached themselves to the hull of a ship. No barnacles have been found in the gallery, but it is plausible that *Monodonta* could have adhered to the bottom of ships and been scraped off in the gallery, if indeed Building P was a ship storage facility. They could possibly have been eaten, although the contexts and preservations could not support this suggestion. *Monodonta* is also an attractive species with its black-and-white dogtooth designs. Topshells are known to have been used in jewellery in the Aegean region (Reese 1984), but no evidence has been found to suggest that *Monodonta* was exploited for ornamentation at Minoan Kommos.

Other attractive shell species found at Kommos are *Pisania*, *Cypraea*, and *Arcularia*. These species could very well have been collected for adornment, although signs of string attachment are not always present or preserved. Seventeen *Pisania* and seven *Cypraea* (cowrie) shells were recovered from mixed levels (MM IB–seventh century B.C.). No holes were found on these specimens, although the latter genus has been considered special for use as money or amulets in some cultures (Jackson 1915: 72). These species have also been recovered from the Minoan town site at Kommos, and some have been modified (Reese 1995d: 261). Of 13 *Arcularia* shells recovered from the MM IB–LM IA periods, 10 were found pierced, suggesting their use as jewellery or dress ornamentation. Of the 120 *Arcularia* shells discovered from the Hilltop and Hillside at Kommos, over 55% were holed, further suggesting their use as ornaments (Reese 1995d: 261). Only at Kommos in Crete are *Arcularia* commonly found both archaeologically and along the modern beach. Reese reports only one from the Royal Road at Knossos and another from Kavousi.

### MOLLUSCS AS CHRONOLOGICAL INDICATORS

Although excavations at Kommos have produced a variety of marine and terrestrial molluscs, three main genera seem significant because of their repeated occurrence in substantial amounts, consistently associated with one particular period. *Murex*, *Glycymeris,* and *Helix* are most common in the shell sample from Kommos. When examined carefully, they can provide useful chronological and environmental information specifically about the site of Kommos. The following study examines the potential use of certain molluscan species as environmental and chronological indicators in archaeology when they originate from well-dated strata from a single period.

#### *Murex*

*Murex* shell is well known from the Aegean as the marine gastropod used to produce purple pigment, particularly for the purpose of dyeing textiles. The three most common species in the Aegean exploited for their dye production are *Murex trunculus*, *M. brandaris,* and *Thais haemastoma,* which produce dye that is purple, pink, blue, or crimson in color. Thousands of fragments from the site (12 kg) were found with a pottery date of MM IB/II. Some shells were found whole, whereas others were found crushed into bits, perhaps as a preparation for melting the shell into lime as a secondary use of the refuse. Another species of marine gastropod, *Euthria*, or *Buccinulum* as it is sometimes referred to, was also recovered in the same context with the *Murex. Euthria* was the only other species found with the *Murex* and was likely collected accidentally; it does not produce dye and occurs in the same environment, often being preyed on by the *Murex*. This combination of species associated with dye manufacturing has been found in Palaikastro in eastern Crete (Reese 1987; Reese, pers. comm.), although *Murex* dye production is known from many excavations around the Aegean. The MM IB/II date coincides with contemporary evidence for dye production in East Crete, particularly Palaikastro and Kouphonisi, and in Keos and Kythera. Dye production from *Murex* is also known from the Greek Mainland from the Middle Helladic period in the Argolid, on Aegina, and more recently, at Eleusis (Ruscillo 1995).

The fragmentary *Murex* and *Euthria* shells were discovered in a concentration at the southeast corner of the Central Court near the South Stoa of Building T. The concentration predates Building T's predecessor Building AA, built during the MM IIB period. The *Murex* debris appears to have been spread intentionally to pave the court during MM IIB, some time after the dye-extracting process. This possibility is further strengthened by the discovery of crushed *Murex* of the same date (MM IB/II) along the North Stoa of the Central Court. Evidence excavated by M. C. Shaw shows that *Murex* was melted at a high temperature to

Table 4.12. Chronological distribution of waterworn *Glycymeris* from the Southern Area.

| Date of context | Percentage of sample |
|---|---|
| MM III/LM IA | 5.1 |
| LM III | 8.2 |
| LM IIIA1 | 9.8 |
| LM IIIA2/B | 65.8 |
| LM III–seventh century B.C. | 11.1 |

make a thin layer of plaster covering the court surface, with the larger fragments of shell ending up around the edges of the court. Shell lime was used for wall plaster in BA Thera and for domestic flooring in BA Cyprus (Reese 1985).

Another burnt MM IB/II *Murex* concentration was found outside the palace wall to the east, isolated from other *Murex* finds. From this distribution of *Murex*, it is likely that the debris was used secondarily as paving or packing for part of the Central Court, part of which was displaced during the movement of fill during the construction of the successive structures, particularly T and/or P. This movement of dirt is supported by the LM IA pottery joins from the area around the South Stoa with those found east of T/P.

Important to this discussion is the consistent date of these *Murex* concentrations. Even without pottery to confirm the period, it is likely that when burnt and fragmentary *Murex* debris is found in a concentration in BA levels at Kommos, the date will be MM IB/II.

### *Glycymeris*

Another marine mollusc found in great quantities at Kommos is *Glycymeris*, or dog cockle. More than 4,800 *Glycymeris* shells were recovered from Kommos from the domestic and civic areas of the site. Approximately 1,250 valves were recovered around House X in the Southern Area alone, and another 2,800 from the other houses on the Hilltop and Hillside. More than 800 valves were recovered from the area in and around Building P.

The shells were all found waterworn and therefore must have been collected after the animals had died. Bivalves have a protective coating on the exterior of the shell called the *periostractum* while the creature is alive and secreting calcium from its gland to encourage shell growth and preservation. When the creature inside dies the bivalve opens and the shell begins eroding, mostly due to friction against the sandy bottom of the sea. The *Glycymeris* shells found at Kommos exhibit this feature.

Table 4.12 summarizes the waterworn *Glycymeris* find dates from the Southern Area. This table can be compared with table 5.28 from *Kommos* I, Part 1, for dog cockles recovered from deposits in the Minoan Town site (Reese 1995d: 255). Both tables reveal *Glycymeris* finds from consistent dates.

Clearly, the majority of the shells came from LM III contexts, particularly LM IIIA2/B. The other LM III contexts are often mixed deposits that could very well include shells from LM IIIA2/B; the pottery information does not always reflect this, but the presence of *Glycymeris* in these deposits could.

The purpose for *Glycymeris* collection on the site is mysterious. Waterworn *Glycymeris* have been found at Knossos, Phaistos, and Myrtos, although these assemblages are not contemporaneous occurrences. At Early Bronze Age Myrtos, Shackleton suggests that "*Glycymeris* appears to have been utilized as eating implements, spoons or scrapers" (Warren 1972: 325). This explanation cannot be applied to the *Glycymeris* at Kommos on the basis of the evidence. Some *Glycymeris* valves are so worn that only a small, flat object remains, hardly useful as a spoon. Moreover, the arbitrary findspots of the Kommos *Glycymeris* all over the site, even in civic areas, in rooms as well as courtyards and roads, implies that the shells were not only for domestic use.

Two other Minoan sites offer another idea that may be applied to some cockle finds at Kommos. At Phaistos, *Glycymeris* shells were found in a Neolithic deposit along with a female clay image and two shallow bowls, suggestive of a shrine. At Knossos, *Glycymeris* were found with other shells in the MM III temple repositories. At Kommos as well, the shrine located in House X had twelve waterworn *Glycymeris* found *in situ* on a stone table. Associated with the *Glycymeris* were miniature juglets, small bowls, a brazier, and a triton shell (*Charonia*). The assemblage is part of a house shrine and suggests that the *Glycymeris* shell at Kommos, particularly during the early LM IIIA2/B period, could have been religiously significant.

The shells from the temple repositories at Knossos are waterworn and hand-painted. The *Glycymeris* have "black bands painted" concentrically following the natural growth markings of the shell (Pl. 4.49; Evans 1964 [reprint]: fig. 377). Some *Glycymeris* at Kommos do exhibit concentric black lines, but the lines are not superficial; they appear as a natural character of the shell (Pl. 4.50). The black coloring, however, does not occur on all shells, and modern comparanda from the beach have not been found. It is possible therefore that the black concentric lines could have been made with an iron-based black pigment that was absorbed by the calcium carbonate, as rust can discolor marble. Future chemical analysis can support or refute this suggestion. The twelve *Glycymeris* from the House X shrine at Kommos, however, did not exhibit black coloring of any kind.

The cockles in these shrine contexts appear to have had some religious significance or symbolism. Over 1,200 *Glycymeris* were recovered from House X alone, mostly from fill deposits of the LM IIIA period. Many more were found associated with contemporary shipshed Building P. Hundreds were recovered from Gallery P3 (214+ valves), chiefly because it is the only gallery fully excavated, but the *Glycymeris* recovered from P3 have a clear date of LM IIIA2/B. In this context, *Glycymeris* appears to have had a functional use. At BA Levantine sites, *Glycymeris* valves have been found in tells by the thousands, even inland. In these contexts, it has been suggested that these waterworn shells may have been used as floor foundations to assist in the drainage of water (Bar-Yosef Mayer 2002: 17). Waterproof flooring would have served well in a shipshed for drainage of water, for prevention of wood rot of the ships' hulls during storage, and for easier sliding of the vessels in and out of the narrow galleries.

Another possibility is that the waterworn cockles were deposited naturally. Distinctive of the valves found on the site is that they are usually larger and heavier than those found on the shore at Kommos today. These larger waterworn specimens could have come from deeper waters or could just be the average size of the species 3,000 years ago. A winter storm or a tsunami occurring at some point during the LM IIIA2/B period could have dredged up these dead cockles from the seafloor and deposited them on the flooded site. Other waterworn shell species have not been recovered with such frequency, but then again the other species that occur at Kommos are lighter and could have been retracted with the withdrawing wave. Studies of tsunami activity show that a large wave dredges up sand from deeper water and carries the contents in a powerful internal current that is unloaded after breaking on the shore (McCoy and Heiken 2000). The retracting wave will drag with it all the lighter contents of the load, leaving mostly the heavier objects in the wave zone (McCoy 2002: pers. comm.). This sorting of beach material is apparent after a storm or seismic event.

Further support for this suggestion comes from excavations in north central Israel at the harbor site of Tel Dor. During the underwater excavation season in the Tantura Lagoon in November 1995, a storm produced large waves that destroyed the scuba installation 50 m from the shoreline (Wachsman and Raveh 1996). Underwater excavations there dredged up hundreds of waterworn *Glycymeris*, many of which were subsequently deposited on the beach after the storm (Wachsman, pers. comm. 1998). This modern event can provide a comparison to what may have happened at Kommos during the LM IIIA2/B period. A storm or a seismic event produced large waves that deposited hundreds of cockles on the site in arbitrary locations. Inhabitants of the site would have found the waterworn shells around their settlement and collected some, perhaps as mementos of a tragic event to be revered lest it happen again. The environmental implications of finding 4,000 waterworn *Glycymeris* predominantly from one period are significant.

As a chronological indicator in archaeological context, when waterworn *Glycymeris* shells are found at Kommos, chances are that the associated pottery will yield a date from the LM IIIA period.

### *Helix*

Terrestrial gastropods also useful in chronological and environmental reconstruction are *Helix* species. *H. aspersa*, commonly cooked in modern times as escargot, appeared at Kommos at the end of the Minoan era, and was flourishing by the seventh century B.C.

*H. aspersa* is a land snail very common in the area today; one can find them in abundance in any field or garden in Crete. Its predecessor at Kommos, however, is *H. melanostoma* (Draparnaud, 1801) (dark-mouthed *Helix*), also an edible gastropod. The diagnostic difference between the two species is that *H. melanostoma* (Pl. 4.51 at *b*) has light and thinner banding along the exterior and a reddish tint on the ventral side of the large body whorl just inside the aperture, a characteristic absent in *H. aspersa* (Pl. 4.51 at *a*). Both species have been found in contexts that could suggest they were exploited for food, but land snails are intrusive in nature and are able to burrow into stratigraphy at any time. Land snails are attracted by carrion or rotting vegetation. They hibernate in the winter under shelter of rocks, trees, and even archaeological ruins. *H. melanostoma* occurs in all levels of the site but seems to have been extirpated by the incoming *H. aspersa* in the early IA. By the fifth century B.C., it appears as if *H. melanostoma* became extinct in the area; there are no traces of them in or around Kommos now. Local villagers report that the dark-mouthed *Helix* (known locally as μπαρμπαρόυσες [*barbaróuses*]) occurs only in the areas of Kaloi Limenes and Lentas today, along the south coast of Crete. *H. melanostoma* is quite sensitive to the landscape and is considerably more "wild" in nature than *H. aspersa*, which thrives in human-altered landscapes like well-irrigated fields or gardens. With the intensification of agriculture and deforestation around Kommos in the LM period (Shay and Shay 1995), the sensitive lifeways of *H. melanostoma* were likely disturbed, so that this species could no longer prosper in the area. Meanwhile, the domestic *H. aspersa* is well adapted to living within sparse vegetation disturbed by irrigation and human passage. This suggestion is supported by John Gifford, who states that the natural vegetation in the area would have been exhausted by the late Bronze Age, leading to slope erosion and sediment accumulation (Gifford 1995).

*Barbaróuses* are also the snails preferred for eating. The modern inhabitants of the nearby village of Pitsidia claim that these snails are tastier than *H. aspersa* but harder to find. The combination of agriculture, human consumption, and ecological competition with the incoming *H. aspersa* eradicated the dark-mouthed *Helix* from the Kommos region. The long-term environmental impact of human occupation on the area has apparently affected the natural history of the area, particularly with respect to the *Helix* genera. The topography around Lentas and Kaloi Limenes, in contrast with the Mesara plain, presents steep slopes that are unsuitable for intensive agriculture. Perhaps the unfriendly topography and the limited human traffic around these landscapes saved *H. melanostoma* from extinction in the Lentas area.

The study of these two species of land snails is useful for chronological and environmental reconstruction, particularly at Kommos. Where *H. melanostoma* occurs in the archaeological stratigraphy, one can be confident that the levels are BA, and where *H. aspersa* occurs, the strata are IA levels. When both occur within the same context, one can be secure about a date between LM III and the fifth century B.C.

### DISCUSSION OF MOLLUSCS AS CHRONOLOGICAL INDICATORS

Molluscs that occur in abundance in consistently dated strata can aid archaeologists in confirming pottery dates or can suggest dates for levels of excavation not producing datable pottery. The presence of a certain species may also extend a date range in mixed deposits where diagnostic pottery is lacking. The case examples of three genera of molluscs found with chronological depositional patterning (CDP) show that faunal materials can aid in the sometimes tricky task of dating archaeological strata. Although ceramic seriation has aided archaeologists in dating artifacts and architecture for decades, it is dependent on the presence/absence of diagnostic pottery; and although molluscs cannot fill the gaps of chronology in archaeological studies, they can nevertheless aid in the process of dating finds and architecture where diagnostic pottery is lacking. At Kommos, *Murex*, *Glycymeris*, and *Helix* are genera that provide environmental and chronological information about the site. Researchers should examine each site for similar patterning with these and other species to contribute to archaeological dating.

### *MUREX* DYE PRODUCTION AT KOMMOS

During the 2001 study season, experiments were conducted to attempt to reconstruct components of the *Murex* dye industry at Kommos. The aims of the project were the following:

1. Conduct a thorough study of the existing literature on ancient and modern dye production from the Aegean and adjacent areas.
2. Examine archaeological remains of crushed *Murex* shells from Kommos.
3. Bait and collect *Murex* from the modern beach at Kommos and nearby Matala.
4. Experiment with modern specimens of *Murex* in dye extraction, concocting and brewing dyes, and dyeing fabrics.
5. Test other species found in association with crushed *Murex* to determine any colors produced.
6. Integrate studies of ancient and modern sources regarding the social and economic impact of dye production and dyed textile trade in the BA Aegean.
7. Investigate the possible role of purple and crimson textiles in the BA and related trade interconnections with different lands and cultures.
8. Experiment with *Murex* shell refuse to crush and melt into lime.

In this section, the preliminary findings of the experimental research are presented.

#### THE ARCHAEOLOGICAL MATERIAL

The inspiration for this study was the archaeological find of the *Murex* debris from the MM IB/II context at Kommos, along with what resembled an industrial installation associated with the crushed *Murex* remains. The shell appears to have been melted into lime at a later date to produce plaster for paving or packing the Central Court of the MM IIB Building AA and/or MM III Building T. Only sections of this paving, particularly around the North and

South Stoas, have been found, but by no means covering the entire court area. Evidence for the plaster level was observed by the author in the scarp during excavations of a sounding along the North Stoa. At this location, a very thin layer of lime with calcined *Murex* inclusions was found intact. Maria Shaw, excavator of the trench, suggested that it may have been a layer used as bedding for a pebble paving for the courtyard. She found the same flooring (*chalikasvestos*) in the southeast corner of the court (93A/16b). Pebbles have been found in all areas of the central court, although not always associated with a plaster bedding.

Thousands of fragments of *Murex* were recovered from excavations in the southeast corner of the court covering some 42 $m^2$ or more, as well as in areas east of Buildings T/P, where masses of earth were presumably moved during the construction of these later buildings. Preservation of the *Murex* material ranged from small complete individuals, some with holes in the main body whorl, to large fragments and tiny crushed pieces (Pl. 4.52).

The presumed installation was found under the floor of Gallery P5 at its west end. It is characterized by a flat stone slab floor extending under the later walls, and a shallow channel 12 cm in width running east-west (Pl. 4.53). Both the slab floor, especially at the western edge, and the channel are packed with crushed *Murex*. Both the architecture and debris share the same MM IB/II date and may even predate Building AA's construction. Crushing *Murex* is an odoriferous task; if an industry was established at Kommos, an installation might have been designed to be easily washed down at the end of each session. *Murex* debris, as was discovered through experiments, attracts wasps, flies, and maggots, which can make work very difficult. The smell at times can be unbearable. An earthen floor would become saturated with *Murex* fluids and pieces and would present a formidable work hazard with pests and odors. It is therefore possible that the architectural finds here represent the earliest *Murex* dye installation found on Crete. A mass of *Murex* would be crushed, and at the end of the session, water would be poured down the paved floor; the channel provided drainage. From levels taken during excavation, the channel appears to be at least 5–11 cm lower than the associated slabs to the south. Fish shops in major towns in modern Greece demonstrate this floor design, with channels on either side of the floor to control drainage. The channel was packed with *Murex* debris toward the western end, further suggesting that there was a flow of water that carried it there. The shell fragments radiated more than 40 $m^2$ from the work space to the west, north, and south of the installation.

With 12 kg of *Murex* material from the sample debris left *in situ*, material still remaining in areas left unexcavated, and countless other shells melted into lime, the dye industry at Kommos must have been significant. Crushed *Murex* (4.4 kg) found along the later Archaic Building Q also resembles the MM IB/II debris, but crushed into tiny pieces along with *Thais* shells (Reese 2000: 645). One interpretation of this later material could be that the *Murex* debris was retrieved from MM IB/II middens and crushed into tiny pieces in preparation to melt it into lime. Reese suggests that it was secondarily crushed and deposited as a floor packing in Q's Room 38. These *Murex* remains from the Archaic period therefore do not necessarily reflect dye-making activities during the historic period at Kommos.

After studying this *Murex* deposit under P5, practical questions arose concerning the making of the dye at Kommos. Where were *Murex* to be found? How were they collected? How many were needed for a garment? What were the problems of production? Why was purple textile considered precious in antiquity, traded and looted as booty from foreign lands (Reinhold 1970)? Under what conditions could lime be made? What problems were encountered during the process? Only experiments with contemporary material could answer these questions.

### Background

With a postdoctoral fellowship from the Institute for Aegean Prehistory (INSTAP), I was able to organize and fund the *Murex* Project in 2001. Assisted by a student from the University of Manitoba, Elizabeth Watson, I endeavored to reconstruct MM dye production at Kommos.

We cleared some dry brush from under the *almiríkia* trees—a hardy tamarisk—just south of the Southern Area site within the Kommos Excavation property. In anticipation of the stench associated with crushing *Murex*, we set up the new dye installation (Pl. 4.54) well away from the village of Pitsidia. Workmen, clearing the dry grass from the site, helped move large brush and rocks into place; they would unknowingly become part of the experiment later on!

BA texts, particularly the Pylos and Knossos tablets, discuss textile trade in the BA Aegean (Melena 1975). The Knossos tablets refer to *po-pu-ro*$_2$, which has been interpreted as "purple," and to *po-pu-re-ja* possibly meaning "female purple dyers" (Palmer 1963: 292, 297, 447). The term *wa-na-ka-te-ro-po-pu-re* in the Knossos tablets likely indicates textiles of "purple befitting the *wanax* (king)," producing an early beginning for what we still call today "Royal Purple." With references even in BA texts to manufacture of purple textiles, nevertheless Linear B does not give details on how purple was made. The earliest source for methods of *Murex* dye production is Pliny the Elder from the first century A.D. Pliny writes of baited baskets and baited pots to collect *Murex* (IX: 125, 133). He also discusses collecting the glands, steeping them in water for twelve days, warming the mixture on the third day. From our experiments based on his recipes, it became clear that Pliny never actually made purple himself. His recipe actually produced a color more gray in tone. Michel and McGovern (1987) examined Pliny's description of purple dyeing with the chemical aspects required for successful coloring. Pliny left out many details, the gaps in which needed to be filled by chemical and experimental testing. To begin with, Pliny did not mention, for example, where baskets and pots should be submerged. Baiting was the first issue to be resolved by experimentation.

### Materials for Experimentation

Several pieces of equipment were required to perform the different phases of experimentation: procuring *Murex*, extracting glands, and dyeing fabric swatches. For baiting *Murex*, two baskets with straight sides and three ceramic pots were required for baiting in two different areas simultaneously. Fish for use as bait were tied into the pots and baskets, and renewed each day. Baskets could take up to six fish each, tied on the sides and on the base. Pots contained one fish each, either tied up through the bottom hole for flower pots, or tied onto the side handles. Ropes were used to tie the pots/baskets together and to anchor them to rocks on the floor of the sea.

A bucket with seawater was prepared for collecting and transporting the *Murex* from the sea to the work site. It was important to keep the snails alive during transport to ensure that their dye was held within the creature until extraction time. On the site, a wooden work bench was set up to accommodate note-taking and the concocting of dye recipes. For dye extraction, metal implements were required for making holes in the shells. Since we could not find bronze tools, we used pointed brass implements. Hard rocks were used as hammers, and the needles from century plants were used for the fine work of separating the hypobranchial gland from the rest of the creature. Although century plants were not introduced into Crete until the Middle Ages (Rackham and Moody 1996), other sharp thorns or metal implements could have been used for this task. A table constructed of a large flat rock and two stone legs was set up as a breaking platform, with another two stones used as seats for the workers.

Three aluminum pots were acquired in which to steep and cook different recipes of dye concurrently. Pliny states that lead pots were used in the Roman period, and Michel and McGovern (1987) state that tin would have worked best; however, we do not know what vats were used by the Minoans. Bronze tripods found during the excavations of the Northwest House and the house southwest of the South House at Knossos (Evans 1964 [reprint]: vol. II, figs. 392 and 394) may provide clues to the metal vessels available at the time.

A propane gas stove was obtained for heating the concoctions, as well as cooking spoons. Freshwater or seawater was used in each recipe. Some of our recipes contained mordants or additives including salt, vinegar, urine, or alum, and others did not. Mordants, which are metal salts of aluminum (alum), copper, and iron, are used to fix natural dyes to fabric. The material to be dyed is first "mordanted" in the chosen metal salt, by heating in water with the mordant. Then, it is transferred to the dye bath and again heated for a permanent, rich color.

Swatches were cut from bolts of cloth, including pure and unbleached wool, cotton, raw silk, and processed silk. Pure, unaltered linen could not be found in time for the experiments, but it was hoped that the pure cotton would reflect similar dyeing properties to that of the flax composition. Each dye concoction was tried with a representative swatch from each fabric type. A drying line was prepared on which to dry the dyed swatches in the shade. Notes were taken, and video/film footage was taken of every step of the procedure.

After the field season at Kommos, testing continued in the Wiener Laboratory of the American School of Classical Studies at Athens. Experiments on dye and shell were conducted there with the support of an INSTAP grant and the director of the lab, Dr. Sherry Fox. Chemical analyses of the purple-stained tools were performed by Harikleia Brecoulaki, a former Geoarchaeology Fellow and associate of the Wiener Lab working with ancient pigments. Microscopic analysis was performed, and further dyeing conducted on pure wool fleece and human hair. A sample of dye was dried out to establish whether the purple powder could be stored long-term and be reconstituted with water at a later time. All dyeing in the lab was performed with the use of an electrical stove top and a fume hood.

Lime experimentation followed by crushing the *Murex* debris in a large mortar. The crushed remains were put in a crucible and placed in the portable kiln in the basement of the American School. Plastic bags with zipper closures were used to store the before-and-after shell samples.

#### Procuring *Murex*

Besides Pliny, who described acquiring *Murex* by means of baited pots and baskets, Julius Pollux later described a series of traps attached by ropes and put in the sea:

> [The traps were] bound together by a sturdy rope so that they could be thrown in the sea, and they attached these containers (κυψέλες) made of a plant material with thick openings at regular intervals hanging like bells. They placed the containers towards the surface with the intention that the creatures could go in but not out. In order to attract the *Murex* into the traps, they placed them on the sea floor around the rocks. The rope made of a kind of cork [bound the traps which] remained overnight and most of the next day when they were retracted full of the creatures.
>
> (Pollux, *Onomastikon* i.4)

Judith Powell interpreted these traps or containers as “creels” for trapping *Murex* (1992: 308). She extrapolates these descriptions back to iconographic representations on Minoan seals from Malia that may depict creels strung together in the sea (see examples of these seals in Powell 1992: LXXVIIIe). In keeping with Pliny and Pollux, one of the baskets and a number of pots were first baited with fish and sunk at Kommos at the southern end of the beach by the cliffs (Pl. 4.55). The bay is large and unprotected, so the pots and the basket needed to be weighed down with rocks so that they would not be moved by currents. Not one *Murex* was caught in either the basket or pots at Kommos in five weeks. In fact, during a rough two days of waves, I returned to find that the pots had been smashed into pieces. This was clearly not how *Murex* were caught in antiquity. I also set up a baited pot and basket in the marina at Matala. Live *Murex* had been seen here in past years, largely owing to the fact that the fishermen, catching them unintentionally in their nets, were throwing them out in the bay. The *Murex* population was sustained here by their feeding on unwanted fish that were also thrown in the bay by fishermen. The tests of baiting in the Matala marina were successful. Overnight the baited basket caught 48 individuals, and the smaller pot caught 18, with more than 100 others collected within a square meter of the bait (Pl. 4.56). The individuals around the pots were hand collected. We learned several things from the baiting experiments:

1. *Murex* do not circulate haphazardly on the floor of the open sea.
2. Baiting in a sheltered sublittoral environment was ideal both for baiting and hand collecting.
3. Baiting where fishing activity normally occurred allowed for preexisting populations of *Murex*.
4. *Murex* had to be attracted with bait.
5. Baiting and hand collecting was the most efficient method to collect the numbers needed.
6. Pots were easier to deal with than baskets because of anchoring problems.
7. With one baited basket left overnight, one person could collect 100 individuals in an hour.
8. More people and more baited containers would collect a proportionate amount of individuals.
9. Baiting without hand collection resulted in a 70 percent reduction in the number of individuals collected.
10. A line with a number of baited pots could be lowered by boat in a fishing area to get thirty to fifty individuals each without diving.
11. Eels, ground-feeding fish, octopi, and possibly sea turtles were also attracted by the baited pots.

Analysis of the archaeological *Murex* remains revealed that the individuals were both baited and hand collected in antiquity. There has been some debate concerning the possibility that *Murex* were raised and/or collected in holding tanks of seawater. If collecting thousands of individuals required for industrial-sized projects, a holding tank to keep individuals alive until extraction might be useful, as suggested by Spanier and Karmon (1987). Archaeological remains of such holding tanks, however, have not been recovered at Kommos.

Pliny states that "purples" can live up to seven weeks without food on their own slime and reach full size at one year (Book IX, 128). Therefore, it is possible that *Murex* could have been raised in tanks, as suggested by Columella (Book VIII, 16.7), although he suggested this specifically for locations that did not have direct access to the sea, unlike Kommos which was established right on the coast. Again, there is no archaeological evidence at Kommos for such tanks.

The presence of young *Murex* in the sample suggested the baiting practice. These small individuals (< 4 cm in length) do not yield much dye and are not worth the trouble of hand collecting and breaking. They are, however, attracted to bait and do get into the snares. Many young individuals in the Kommos sample were found intact, suggesting that the Minoans came to the same conclusion about these small creatures.

*Euthria* and dead *Murex* individuals were present in the archaeological samples. We collected these specimens accidentally by hand. Some *Murex* were attached to *Euthria* specimens and were inadvertently collected together. *Murex* are carnivorous and prey on other shellfish, like *Euthria*, by boring holes through the shell of their prey and eating the contents with a tonguelike appendage. Many archaeological *Euthria* were found with a naturally bored hole on the main body whorl. One can be observed in Pl. 4.52 among the *Euthria* individuals on the left. Many *Euthria* were not broken within the other debris. Experiments showed that the animal inside the *Euthria* shell was orange in color but did not produce any dye.

Waterworn, sometimes-*Vermetus*-covered *Murex* shells were also recovered from the sample. The death of the creature inside halts the calcium renewal of the shell and makes it prone to wear by surf action. *Vermetus* is a parasitic crustacean that grows on rocks and other hard marine surfaces. Larvae can attach themselves on dead shells and grow in a thin tubular shell formation. The presence of *Vermetus* shell and signs of water wearing shows that a shell died in the water. Several of these specimens were found in the archaeological sample, as well as in the modern sample that we collected. We collected them unintentionally, not distinguishing them from live ones on the sea floor.

Minoans, therefore, must have manually collected as well as baited *Murex*, just as we did. The presence of young *Murex* in the sample suggests baiting, and the presence of *Euthria* and dead shells indicates hand collection. As we have seen, a combination of the two procuring techniques produces the greatest yield of individuals. The Minoans seem to have observed this as well.

A total of six dyeing sessions were conducted with *Murex*, each session using between 103 and 161 specimens. At the end of six weeks, we had collected a total of 825 specimens, enough to dye about 40 swatches as dye samples.

#### Extraction Techniques

After each diving session at Matala, more than 100 *Murex* individuals were transported to the work site at Kommos. The individuals were kept alive in seawater because the mucus of dead individuals tends to dry out. The shells were broken one by one using a pointed brass implement and a hard stone used as a hammer (Pl. 4.57). Breaking the individuals was difficult without first making a hole in the shell. The shell composition is so hard that its structure has to be weakened by piercing it first with hammer and point, and then hitting it with a rock. The piercing allowed us to break the shell in the correct spot to reveal the gland. The hypobranchial gland is responsible for mucus production in *Murex*. At first, it was not obvious which gland needed to be separated, because there is no purple-colored gland in the creature. After dissecting the first couple of specimens by organ, it became clear which gland was the one required to produce purple dye. The hypobranchial gland is located directly under the major body whorl. It is beige and has a black line running through it (Pl. 4.58). The mucus produced by this gland is clear, but after release, the mucus oxidizes and becomes purple, as was most evident from our fingers. The needle from the century plant was then scraped along the bottom and sides of the gland to remove it. The glands were then placed one by one in a covered pot with a cup of water, and the rest of the creature was thrown out. The debris attracted wasps and flies and smelled very bad. Owing to the nature of their diet (carrion), even fresh *Murex* smelled rotten. Apart from enduring the stench and warding off the wasps and flies, we discovered that it was impossible to stop flies from laying their larvae in our concoction and in the debris. Although the pot was well fitted with a lid, the flies would lay the larvae on the rim of the pot and push them under the lid with their hind legs. Within minutes, the dye mixture was swarming with maggots.

After we had extracted all the glands, the mixture was left to steep for three days to extract the maximum amount of mucus, resulting in a deeper hue of purple. The debris was buried in refilled Trench 78A in the Southern Area, to be dug up in a few years to study the preservation of the shells.

#### Concocting Dye

Six main recipes were tried with different concentrations of water, varying steeping times, and different types of additives. The less diluted the mixture was with water, the deeper and more vibrant the purple would be. Fabric dyed with an already-used mixture was faded and flat in color. We also discovered how blues were made. If all the glands were placed in a pot and the fabrics dipped right away for ten minutes without prior steeping and then hung to dry, the swatches turned "Biblical Blue." The color range produced from our experiments was blackish purple to light purple, gray-purple to lavender, and light blue to navy blue (Pl. 4.59). Pliny's experiment turned into a disenchanting gray-purple. Clearly then, the twelve days of steeping recommended by him were not required, and heating without fabric only served to kill off the maggots in the mixture.

The mixtures, except for the blue, were heated gently to around 90°C. At this point, the heat was turned off and the swatches introduced to the mixture. The longer the fabric stayed in the concoction, the more color was absorbed. Redyeing the same swatches in the same mixture the next day resulted in only a slightly darker color. The most striking aspect of making *Murex* dye is the heavy odor. For example, one day while we were heating a dye concoction, the site workmen complained about the stench at their lunch area 50 m away. Dye installations were sure to have been established a good distance from any dwelling in antiquity. In general, from the dyeing experiments, we learned the following points:

1. *Murex* dye adheres to fabrics without the use of mordants.
2. Minimal water produces deeper colors.
3. Urine makes the purple color more vibrant.
4. Bringing the mixture to a boil produced a gray color.
5. Steeping for three days made a deep vibrant purple.
6. Steeping for more than three days was unnecessary.
7. Many shades could be produced from the same animal.
8. The odor of the mixture was even more terrible after three days.

9. Dyed swatches maintained their color and their reek even after washing.
10. Dyed hands remained colored for six weeks until the nails grew out.
11. *Murex* mucus could have been used for temporary tattooing, like henna.
12. Biblical Blue was indeed made from *Murex* species as well as Royal Purple.
13. Wool absorbed the most dye and attained the deepest shades.
14. Pure cotton, and probably linen, does not retain a nice color.
15. Processed silk produced the nicest colors, by today's standards.
16. Lots of perfume would have been required on new garments.

To make a sample of Royal Purple took a minimum of four days, not including the airing-out period. We calculated that if a piece of wool 125 cm square required 200 *Murex* to make a deep purple color, than a whole wool cloak would require at least 5,000 *Murex* for a nice even color. This estimate is considerably lower than what was originally calculated by scholars: sometimes as many as 20,000 individuals just for the trim of a garment. Procuring 5,000 *Murex* was no easy task, however.

**Summary**

*Murex*-dyed textiles were "precious" in the ancient world and worn only by officials and rulers for a number of reasons. First, the sheer amount of labor involved could be devoted only to persons of influence. Slaves, as opposed to specialists, may have made Royal Purple simply because of the danger involved in procuring *Murex* from the sea, the difficulties associated with insect infestation and stinging wasps, and the extremely dense and unpleasant smell of the *Murex* dye itself. Slaves, in this case, would be distinguishable by the color of their hands. The suggestion has been made that textile dyeing was performed by women referred to by the term *po-pu-re-ja* in the Knossos tablets, "female purple dyers" (Palmer 1963). Ethnographic studies in Asia and Africa have repeatedly shown that collecting shellfish is considered the work of women and children (Claassen 1998). Perhaps local or slave women at Kommos were ordered to produce *Murex* dye in the MM period for the elite at Phaistos. One can only speculate.

From the comparison of archaeological debris and modern *Murex* debris, it appears as if *Murex* was procured by baiting and manual collection. Ceramic pots, as opposed to reed baskets, were likely baited, because baskets were very difficult to keep anchored. Ceramic pots could have easily been strung in a series with rope and sunk in the harbor. A harbor or fishing boat marina would have been ideal for *Murex* collection because of the precondition of available food there for *Murex*. The Papadopláka islet, which was more extensive in the BA at Kommos (Gifford 1995), would have provided shelter for a natural harbor. This is likely where the Kommos *Murex* were acquired in antiquity.

The MM IB/II architecture in the area under P5 in the Southern Area of the site likely represents a dyeing installation. The distance of the installation from the contemporary town site is adequate to keep the dense odor of the dyeing away from the domestic area. The proximity of the installation to the harbor at Kommos is convenient for procuring and transporting *Murex* to the work site. Furthermore, the installation is surrounded by contemporary *Murex* debris, some filling drainage channels emanating from the work area. This dyeing installation, then, is the earliest found on Crete, and one of the earliest Royal Purple industrial areas in the Mediterranean Basin.

Metal cauldrons were likely used for concocting, steeping, and/or heating dye mixtures. The production of bolts of purple textile in industrial quantities, perhaps for trade, tribute, or by commission, would have required the procurement of thousands of *Murex* individuals. Seawater would have been used in the mixture, and perhaps human urine or vinegar as an additive for colorfastness or color enhancement. We found that no mordant was required for colorfastness, although additives like salt, vinegar, and especially urine contributed to the color enhancement during our experiments.

The debris from *Murex* dye production was then ground up into small fragments and heated in a kiln at over 900°C for more than five hours to produce lime for making floor and wall plaster. The only evidence for *Murex* floor plaster has been found at Kommos.

## Interpreting Space Usage

Through analysis of the spatial and temporal distribution of the faunal remains, the use of rooms and spaces in associated contexts can become clearer. In the case of the Southern Area, massive building projects occurred in the same location between the MM IIB and Hellenistic periods, causing significant movements of earth. Pure deposits containing fauna are especially rare because the Southern Area was always used as a civic center rather than as a domestic district. Therefore, the majority of the bone remains in dumps were deposited prior to the construction of the buildings in the Southern Area in the MM IIB period.

Pure levels dating to the MM IB period were excavated under the floors in P1 at the building's east end. A dump from this period was found under P1 containing pure MM IB pottery and bones from bovids and suids. Shells were also recovered represented by *Murex* and *Euthria* fragments, pieces of Triton shell (*Charonia*), and a few *Monodonta* and *Patella* shells. Five fossil oysters and three land snails (*Helix melanostoma*) were also uncovered, probably occurring naturally in this early stratigraphy. This assemblage of bone and shell remains is typical of a general refuse dump. The few bits of *Murex* with *Euthria* known elsewhere from the site as dye industry refuse, and the three pieces of Triton shell also producing dye, suggest that this refuse was not exclusively from a kitchen site. Rather, it appears as if the site was used over the period of years for all types of garbage rather than from one event, and represents refuse from settlers on the Central Hillside. The findspot under the floor of P1 is probably not the primary location of the dump. Rutter and Van de Moortel have identified this feature as part of a construction fill during the building of AA or T. A similar dumping site was found to the east of T/P, discussed previously in relation to *Murex* debris. The faunal finds to the eastern extent of the site represent, again, a general dump secondarily deposited as construction fill. The dates from this dump are consistently MM IB/II. The refuse contains the same species profile as the dump under P1, that is, bones from bovids and suids, a few pieces of *Murex* and *Euthria*, *Charonia*, and a couple of *Monodonta* and *Patella* shells.

### BUILDING AA

Identifying and interpreting spaces in Building AA are two different problems. AA is the earliest structure uncovered in the Southern Area, and therefore its associated finds are the most difficult to distinguish of all the overlying buildings and occupation debris. Building T, its successor, reused much of its architecture and, hence, many of the same spaces, a pattern followed with the later LM III Building P. Thus, AA also suffers the disadvantage of having had a succession of massive construction projects occur directly above its own structure, upsetting any floor deposits and much of the stratigraphy associated with its construction and use.

Thirty-two pottery deposits and subdeposits from AA have been identified by Van de Moortel (Chap. 3.2). Table 4.13 lists the pottery groups associated with faunal remains. Where faunal remains were not recovered, the listing appears as "No fauna"; in terms of identifying space usage, finding no faunal remains can be as indicative of space usage as finding them. In the "Location" column, directions have been abbreviated with the letters N, S, E, W, representing north, south, east, and west, respectively. The species are presented in phylogenetic and alphabetic order. Therefore, the fossil oysters are listed first, followed by the marine remains in alphabetic order, and the mammalian remains are alphabetized according to species and bone element. Whenever animal bones were too fragmentary to identify to genus, the term "Mammal bone" appears under "Species." No fish or bird remains were recovered from MM deposits in the Southern Area. In the "Comments" column, the age, sex, and notable preservation is provided (butchered, burnt). Most bone remains are assigned the age "Immature +." This age category is indicated diagnostic information is not preserved to indicate more specific age, and where juvenile cortex is absent in the bone.

Most of the fauna from AA and pre-AA contexts actually date to a time prior to the use of the building. Van de Moortel believes that some of these remains are related to pre-AA occupation rather than to simple construction fill for the building. Perhaps the Southern Area was occupied in the MM IB period, indicated by the earthen floor found below the level of the "causeway" in the center of the AA/T court. Otherwise, the MM IB–IIB Early faunal remains could represent refuse associated with contemporary houses on the Hilltop and Central Hillside. The phases of AA have been separated by pottery groups as follows:

| | |
|---|---|
| Building AA construction fill: | Groups A–Ji |
| Building AA use deposits: | Groups K–O; 2a, 4a, 5a, 21 (Rutter [Chap. 3.3]) |
| Pre-AA deposits: | Groups X–Z |

Table 4.13. Pottery groups from Building AA with associated faunal remains (MM IB–IIB).
See Chap. 3.2 for discussion of the pottery groups.

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| A | Sounding north of Q | Fossil oyster | 0 | 1 | |
| | | *Ovis/Capra* mid metatarsus | 0 | 2 | Immature + |
| | | *Ovis/Capra* molar | 0 | 1 | Immature + |
| Ba | East sounding southeast of J | Reese (1995e) | | | |
| Bb | West sounding southeast of J | Reese (1995e) | | | |
| Bc | Sounding below T10 | No fauna | 0 | 0 | |
| Bd | Sounding below North Stoa | Reese (1995e) | | | |
| C | Oval pavement J | No fauna | 0 | 0 | |
| Da | Sounding below west P4 | No fauna | 0 | 0 | |
| Db | Court west of P5 | No fauna | 0 | 0 | |
| Dc | Sounding below slabs in P5 | No fauna | 0 | 0 | |
| E | Southwest part of South Stoa | Fossil oyster | 0 | 3 | |
| Fa | Southwest part of South Stoa | No fauna | 0 | 0 | |
| Fb | Floor packing east of South Stoa | *Euthria* | 0 | 1 | |
| | | Fossil oyster | 0 | 1 | |
| | | Mammal bone | 0 | 1 | Immature + |
| G | East of columns of South Stoa | No fauna | 0 | 0 | |
| H | East of drain in South Stoa | No fauna | 0 | 0 | |
| I | East of drain in South Stoa | No fauna | 0 | 0 | |
| Ja | Casemate below P1 | Fossil oyster | 3 | 12 | |
| | | *Bittium* | 0 | 1 | |
| | | *Charonia* | 0 | 3 | Burnt |
| | | *Euthria* | 2 | 1 | |
| | | *Glycymeris* | 1 | 1 | |
| | | *Monodonta* | 5 | 7 | |
| | | *Murex trunculus* | 4 | 75 | Burnt |
| | | *Patella caerulea* | 16 | 7 | |
| | | *Euconulus* | 2 | 0 | |
| | | *Helix melanostoma* | 7 | 4 | |
| | | *Oxychilus* | 1 | 0 | |
| | | *Bos* proximal L femur | 0 | 1 | < 3 years |
| | | *Bos* proximal L femoral epiphysis | 0 | 1 | < 3 years |

*(Table 4.13 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | *Bos* or *Equus* | 0 | 4 | Immature + |
| | | *Capreolus*(?) L glenoid | 0 | 1 | Immature + |
| | | Mammal mid scapula | 0 | 1 | Immature + |
| | | Mammal mid tibia | 0 | 1 | Immature + |
| | | Mammal bones pieces | 0 | 7 | Immature + |
| | | *Ovis/Capra* atlas | 0 | 3 | Immature + |
| | | *Ovis/Capra* coronoid process | 0 | 1 | Immature + |
| | | *Ovis/Capra* proximal L femur | 0 | 1 | Juvenile |
| | | *Ovis/Capra* L glenoid | 0 | 1 | Immature + |
| | | *Ovis/Capra* distal L humerus | 0 | 1 | > 8 mos |
| | | *Ovis/Capra* mid humerus | 0 | 1 | Immature+; butchered |
| | | *Ovis/Capra* mid L mandible | 0 | 2 | > 1 year |
| | | *Ovis/Capra* mid L mandible | 0 | 1 | Immature + |
| | | *Ovis/Capra* mid R mandible | 0 | 1 | Immature + |
| | | *Ovis/Capra* anterior mandible | 0 | 1 | Immature + |
| | | *Ovis/Capra* molar | 1 | 2 | > 1 year |
| | | *Ovis/Capra* mid scapula | 0 | 2 | Immature + |
| | | *Ovis/Capra* proximal L tibia | 0 | 1 | > 3 years |
| | | *Ovis/Capra* mid R tibia | 0 | 1 | Immature + |
| | | *Ovis/Capra* proximal L ulna | 0 | 1 | < 3.5 years |
| | | *Ovis/Capra* vertebra | 0 | 1 | Adult |
| | | *Ovis/Capra* vertebra | 0 | 2 | < 4 years |
| | | *Ovis* cranium | 0 | 1 | Immature + |
| | | *Sus* acetabulum | 0 | 1 | > 6 mos |
| | | *Sus* cervical vertebra | 0 | 1 | < 4 years |
| | | *Sus* cranium | 0 | 1 | Immature + |
| | | *Sus* mid R femur | 0 | 1 | Immature + |
| | | *Sus* mid R humerus | 0 | 1 | Immature + |
| | | *Sus* mid ilium | 0 | 1 | Immature + |
| | | *Sus* incisor | 0 | 1 | < 1 year |
| | | *Sus* incisor | 0 | 1 | > 1 year |
| | | *Sus* ischium | 0 | 1 | > 6 mos |
| | | *Sus* lumbar vertebra | 0 | 1 | < 4 years |

(*continued*)

*(Table 4.13 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | *Sus* anterior mandible | 0 | 1 | > 1 year |
| | | *Sus* mid R mandible | 0 | 2 | 6–8 mos |
| | | *Sus* mid mandible | 0 | 3 | < 8 mos |
| | | *Sus* mid mandible | 0 | 1 | > 8 mos |
| | | *Sus* maxilla | 0 | 1 | Immature + |
| | | *Sus* molar | 0 | 1 | > 1 year |
| | | *Sus* metapodial | 0 | 1 | < 2 years |
| | | *Sus* proximal phalanx | 0 | 1 | < 10 mos |
| | | *Sus* proximal phalanx | 1 | 0 | > 10 mos |
| | | *Sus* articular rib | 0 | 1 | Immature + |
| | | *Sus* supraorbital torus | 0 | 1 | Juvenile |
| | | *Sus* mid R scapula | 0 | 1 | Immature + |
| | | *Sus* mid tibia | 0 | 1 | Immature + |
| | | *Sus* proximal R tibia | 0 | 1 | Immature + |
| | | *Sus* mid L tibia | 0 | 1 | Immature + |
| Jb | West of casemate below P2 | *Helix aspersa* | 1 | 1 | |
| | | *Helix melanostoma* | 1 | 0 | |
| | | Mammal bones | 0 | 17 | |
| | | *Murex trunculus* | 0 | 36 | |
| | | *Patella caerulea* | 0 | 1 | |
| | | *Ovis/Capra* second premolar | 1 | 0 | > 1 year |
| | | *Ovis/Capra* mid L radius | 1 | 0 | < 3 years |
| | | *Sus* occipital condyle | 0 | 1 | Immature + |
| Jc | Casemate below P2 | Mammal vertebra | 0 | 1 | Immature + |
| | | *Ovis/Capra* second molar | 1 | 0 | > 1 year |
| | | *Ovis/Capra* mid radius | 0 | 1 | Immature + |
| | | *Sus* maxilla | 0 | 1 | > 6 mos |
| | | *Sus* medial phalanx | 1 | 0 | > 6 mos |
| | | *Sus* first premolar | 1 | 0 | > 6 mos |
| | | *Sus* mid radius | 0 | 1 | Immature + |
| Jd | Sounding below P3 | No fauna | 0 | 0 | |
| Je | Casemate below P3 | Fossil oyster | 0 | 2 | |
| | | *Euthria* | 1 | 0 | |
| | | *Murex trunculus* | 0 | 1 | |
| | | *Ostrea* | 0 | 1 | |

(*Table 4.13 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | *Bos* tarsal | 0 | 1 | Immature + |
| | | *Bos* mid tibia | 0 | 1 | Immature + |
| | | *Bos* proximal R ulna | 0 | 1 | < 3.5 years |
| | | *Bos* or *Equus* piece | 0 | 1 | Immature + |
| | | Mammal bone | 0 | 1 | Immature + |
| | | *Ovis/Capra* R calcaneum | 1 | 0 | > 3 years |
| | | *Ovis/Capra* mandible diastema | 0 | 1 | Adult |
| | | *Ovis/Capra* R maxillary molar | 0 | 1 | Adult |
| | | *Ovis/Capra* mid metatarsus | 0 | 1 | Immature + |
| | | *Ovis/Capra* mandibular premolar | 1 | 0 | > 1 year |
| | | *Ovis/Capra* mid radius | 0 | 1 | Immature + |
| | | *Ovis/Capra* mid rib | 0 | 1 | Immature + |
| | | *Ovis/Capra* distal R tibia | 0 | 1 | > 2 years |
| | | *Ovis/Capra* mid tibia tool (Bo 60) | 0 | 2 | Worked |
| | | *Sus* maxilla | 0 | 1 | 6–8 mos |
| | | *Sus* maxillary molar | 0 | 2 | Adult |
| | | *Sus* mandibular molar | 0 | 1 | > 1 year |
| | | *Sus* mandibular second premolar | 1 | 0 | > 1 year |
| | | *Sus* mid scapula | 0 | 1 | Immature + |
| Jf | Strata east of P1, P2, and P3 | Fossil oyster | 0 | 3 | |
| | | Bittium | 0 | 1 | |
| | | *Charonia* | 0 | 2 | |
| | | *Euconulus* | 1 | 1 | |
| | | *Euthria* | 3 | 0 | |
| | | *Glycymeris* | 1 | 1 | Burnt |
| | | *Helix* | 0 | 1 | |
| | | *Helix melanostoma* | 21 | 2 | |
| | | *Monodonta* | 6 | 1 | |
| | | *Murex trunculus* | 1 | 75 | Some burnt |
| | | *Patella caerulea* | 6 | 0 | |
| | | *Patella lusitanica* | 2 | 0 | |

(*continued*)

*(Table 4.13 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | *Bos* medial phalanx | 0 | 2 | > 10 mos |
| | | Dama proximal L metatarsus | 0 | 1 | Immature + |
| | | Mammal bones | 0 | 8 | Immature + |
| | | *Ovis/Capra* distal L humerus | 0 | 1 | > 6 mos |
| | | *Ovis/Capra* R mandible | 0 | 1 | > 1 year |
| | | *Ovis/Capra* posterior L mandible | 0 | 1 | < 1 year |
| | | *Ovis/Capra* maxillary second molar | 1 | 0 | Adult |
| | | *Ovis/Capra* mandibular molar | 0 | 3 | Immature + |
| | | *Ovis/Capra* R third molar | 1 | 0 | < 2 years |
| | | *Ovis/Capra* distal metapodial | 0 | 1 | Juvenile |
| | | *Ovis/Capra* mid rib | 0 | 2 | Immature + |
| | | *Ovis/Capra* distal L tibia | 0 | 1 | > 2 years |
| | | *Ovis/Capra* mid L ulna | 0 | 1 | Immature + |
| | | *Ovis distal* L humerus | 0 | 1 | > 6 mos |
| | | *Sus* mandibular canine | 0 | 1 | ♀ > 1 year |
| | | *Sus* cranium | 0 | 3 | Immature + |
| | | *Sus* distal R humerus | 0 | 1 | > 8 mos |
| | | *Sus* mid L humerus | 0 | 1 | Juvenile |
| | | *Sus* mandibular incisor | 1 | 0 | < 1 year |
| | | *Sus* mandibular incisor | 1 | 0 | > 1 year |
| | | *Sus* R mandible | 0 | 1 | ♂ adult |
| | | *Sus* mandible | 0 | 2 | Immature + |
| | | *Sus* mid mandible | 0 | 1 | < 2 years |
| | | *Sus* maxilla | 0 | 1 | < 2 years |
| | | *Sus* maxilla | 0 | 1 | Adult |
| | | *Sus* proximal phalanx | 0 | 1 | > 10 mos |
| | | *Sus* mandibular second premolar | 1 | 0 | > 1 year |
| | | *Sus* mid scapula | 0 | 2 | Immature + |
| | | *Sus* vertebra | 0 | 2 | < 4 years |

*(Table 4.13 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| Jg | Surface below road of T, North Wing | No fauna | 0 | 0 | |
| Jh | Sounding below road of T, North Wing | *Cerithium* | 0 | 1 | |
| | | *Murex trunculus* | 0 | 2 | |
| | | *Patella caerulea* | 0 | 1 | |
| | | *Patella lusitanica* | 2 | 0 | |
| | | *Bos* or *Equus* | 0 | 1 | Immature + |
| | | *Capra* mid horncore | 0 | 2 | > 1 year |
| Ji | Soundings below T24a | Reese (1995e) | | | |
| K | Fill or floor deposit outside drain in South Stoa | No fauna | 0 | 0 | |
| L | *Sottoscala* below P6 | *Euthria* | 4 | 1 | |
| | | *Euconulus* | 2 | 0 | |
| | | *Murex trunculus* | 0 | 22 | Some burnt |
| M | Fill of drain in South Stoa | *Euconulus* | 3 | 0 | |
| | | *Euthria* | 46 | 0 | |
| | | *Helix melanostoma* | 17 | 55 | |
| | | *Murex brandaris* | 3 | 0 | |
| | | *Murex trunculus* | 0 | 140 | |
| | | *Patella caerulea* | 1 | 0 | |
| | | *Patella lusitanica* | 1 | 0 | |
| N | Small fill below P3 | Mammal bone | 0 | 1 | |
| O | Paved floor of Room T5A | Reese (1995e) | | | |
| X | Fill between north-south paved | Reese (1995e) | | | |
| Y | Fill on earliest floor south of AA | Fossil oyster | 0 | 3 | |
| Z | Floor deposit south of AA | Fossil oyster | 0 | 1 | |
| | | *Bittium* | 0 | 1 | |
| | | *Euthria* | 0 | 1 | |
| | | *Murex trunculus* | 0 | 3 | |
| | | *Bos* or *Equus* | 0 | 1 | |
| | | Mammal bone | 0 | 3 | |

Reese (1995e) = *Kommos* I (2), chap. 5, "The Minoan Fauna"

Most remarkable about this group of fauna is that most of the MM fauna from the Southern Area comes from Van de Moortel's Location 10, represented by Groups Ja–Ji. These groups all contain pottery dating to the MM IB–IIB Early period. Marine remains as well as bovids and suids were found here, attesting to an MM dumping ground or a pre-AA occupation.

The presence of animals of all ages, juvenile to old adult, suggests that the dump site from which this fill was acquired did not contain the refuse from one event but rather was an accumulation from over time. The inclusion of cervid remains (Jf and possibly Ja) in this area indicates hunting by the locals in the early MM period. Only one bone for each cervid species survives. Perhaps the rest of the cervid and other animal remains are still in their original dumping location (prior to AA casemate filling) or have been identified by Reese in the Minoan Town fauna. Association between skeletons in the Southern Area and elsewhere on the site, however, cannot be made given the state of preservation. Such an association would suggest that the Southern Area was merely a dumping site in the early MM period for the Minoan town at Kommos.

Many deposits containing significant amounts of *Murex* remains date to pre-AA periods on the site (Ja, Jb, Jf, Z). This is to be expected, since we have already established the date for the original *Murex* dye industry to be MM IB/MM II. Finds in Groups L and M, identified with periods of the use of AA, have been found with significant numbers of *Murex* and *Euthria*. The contents of the *sottoscala* below P6 (Group L), and the fill of the drainage channel close to the South Stoa (Group M), gives a date from the MM IIB late period. Could, then, the *Murex* dye industry have been contemporary with the early use of AA in the late MM IIB period? Could Building AA have had a direct relation with the industry?

In general, not many "edibles" were found in AA use contexts, suggesting that a kitchen or dining area was not recovered from excavations of this early building.

### BUILDING T

Faunal assemblages from areas within Building T, contemporary with its construction and use, have been distinguished by Rutter from his analysis of the pottery in this volume (Chap. 3.3). The following pottery groups define deposits dating from the end of the MM III period through LM II. Specific areas and periods, identified through ceramic provenance by trench and pail numbers, have been associated with the faunal remains found in these contexts. The fauna are presented along with their relevant pottery groups in Table 4.14. Where trench numbers were of pre-1990 excavations (< Trench 70), faunal lists produced by Reese during his analysis have been referred to. These lists are referred to as "Reese" in the first line of the "Comments" column, where applicable. Excavations in the Southern Area between Trenches 11A and 70A were studied by Reese but not published because of the geographic focus of the previous *Kommos* volumes on the Minoan Town site and the later Greek Sanctuary. Not all earlier trenches in the Southern Area had fauna, and many pails were integrated into larger groups, so that individual pails could not be separated out again. Cases such as these

Table 4.14. Pottery groups from Building T with associated faunal remains (MM III–LM II). See Chap. 3.3 for discussion of the pottery groups.

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 1 | Initial use floor of T under P2 | Mammal vertebra | 0 | 1 | Immature + |
| | | *Sus* medial phalanx | 1 | 0 | > 10 mos |
| | | *Sus* mid radius | 0 | 1 | Immature + |
| 2a | T23, first floor | No fauna | 0 | 0 | |
| 2b | T23, second floor | *Euthria* | 1 | 0 | Reese |
| | | *Glycymeris* | 0 | 1 | |
| | | *Helix* | 1 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | *Pisania* | 1 | 0 | |
| | | Mammal bones | 0 | 6 | |
| 3a | T24a, first floor | *Murex trunculus* | 0 | 1 | Reese |
| | | *Paracentrotus* spine | 2 | 0 | |
| | | Fish bone | 2 | 0 | |
| | | Rodent bone | 1 | 0 | |
| 3b | T24a, second floor | Fossil oyster | 1 | 0 | Reese |
| | | *Murex trunculus* | 1 | 0 | |
| 4a | T24b, first floor | *Murex trunculus* | 0 | 1 | Reese |
| | | Mammal bone | 0 | 1 | |
| 4b | T24b, second floor | *Murex trunculus* | 1 | 0 | Reese |
| | | Mammal bone | 0 | 3 | |
| 5a | T25a, first floor | No fauna | 0 | 0 | |
| 5b | T25a, second floor | No fauna | 0 | 0 | |
| 6 | T19, floor | Fossil oyster | 0 | 5 | Reese |
| | | *Bittium* | 2 | 0 | |
| | | *Cerithium* | 3 | 0 | |
| | | *Columbella* | 1 | 0 | |
| | | *Conus* | 1 | 0 | |
| | | *Monodonta* | 13 | 0 | |
| | | *Murex trunculus* | 6 | 1 | |
| | | *Patella* | 496 | 0 | |
| | | *Pisania* | 1 | 0 | |
| | | Crab | 0 | 2 | |
| | | Land snail | 19 | 0 | |

(*continued*)

*(Table 4.14 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | Mammal bone | 0 | 18 | |
| 7 | T42, floor | *Murex* | 1 | 0 | Reese |
| | | *Patella* | 1 | 0 | |
| | | Mammal bone | 0 | 4 | 1 burnt |
| 8 | T North Stoa, Space 16, floor | No fauna | 0 | 0 | |
| 9a | Southwest end under P5, T floor | Fossil oyster | 1 | 0 | Reese |
| 9b | Southwest end under P5, T floor deposit | Fossil oyster | 2 | 0 | |
| | | *Euthria* | 1 | 0 | |
| | | *Glycymeris* | 3 | 0 | |
| | | *Murex trunculus* | 1 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | *Canis* mid rib | 0 | 1 | Immature + |
| | | Mammal bone | 0 | 1 | Immature + |
| 10 | Northwest end under P5, T floor | *Euthria* | 1 | 0 | |
| | | Mammal bone | 0 | 2 | |
| 11 | South facade of T | *Euthria* | 10 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex brandaris* | 1 | 0 | |
| | | *Murex trunculus* | 0 | 26 | |
| | | *Patella caerulea* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | |
| 12 | South facade of T, fill above surf | Glycymeris | 1 | 0 | |
| | | *Murex trunculus* | 1 | 0 | |
| 13 | Southeast corner of T South Stoa | *Euthria* | 1 | 0 | |
| | | *Murex trunculus* | 1 | 0 | |
| | | *Patella caerulea* | 2 | 0 | |
| 14 | T South Stoa, below kiln dump | No fauna | 0 | 0 | |
| 15 | T corridor 20, east end | No fauna | 0 | 0 | |
| 16 | T21, floor | *Conus* | 1 | 0 | Reese |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex* | 3 | 0 | |
| | | *Patella* | 2 | 0 | |
| | | Land snail | 1 | 0 | |
| | | Mammal bone | 0 | 1 | |

*(Table 4.14 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 17a | T19, floor | Fossil oyster | 0 | 5 | Reese |
| | | *Bittium* | 2 | 0 | |
| | | *Cerithium* | 3 | 0 | |
| | | *Columbella* | 1 | 0 | |
| | | *Conus* | 1 | 0 | |
| | | *Monodonta* | 13 | 0 | |
| | | *Murex trunculus* | 6 | 1 | |
| | | *Patella* | 496 | 0 | |
| | | *Pisania* | 1 | 0 | |
| | | Crab | 0 | 2 | |
| | | Land snail | 19 | 0 | |
| | | Mammal bone | 0 | 18 | |
| 17b | T42, earthen floor | *Columbella* | 1 | 0 | Reese |
| | | *Patella* | 99 | 0 | |
| | | Mammal bone | 0 | 3 | |
| 18 | T North Stoa, Space 16, floor | No fauna | 0 | 0 | |
| 19 | T South Stoa, east of kiln | Fossil oyster | 1 | 0 | |
| | | *Bittium* | 1 | 0 | |
| | | *Euthria* | 1 | 0 | |
| | | *Monodonta* | 2 | 0 | |
| | | *Murex trunculus* | 2 | 0 | |
| 20 | T23, fill | No fauna | 0 | 0 | |
| 21 | T29, floor | Mammal bone | 0 | 1 | Reese |
| 22a | T20/22, west end fill | Fossil oyster | 2 | 0 | Reese |
| | | *Gibbula* | 1 | 0 | |
| | | Mammal bone | 0 | 10 | |
| 22b | T20/22, west end, upper fill | *Murex* | 1 | 0 | Reese |
| | | Land snail | 1 | 0 | |
| | | Mammal bone | 0 | 14 | 4 burnt |
| 23 | T20/22 west end, floor final use | *Bittium* | 1 | 0 | Reese |
| | | *Fasciolaria* | 1 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Patella* | 180 | 0 | |
| | | Mammal bone | 0 | 16 | 1 burnt |

(*continued*)

*(Table 4.14 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 24 | T20/22 west end, floor | *Monodonta* | 1 | 0 | Reese |
| | | *Murex* | 2 | 0 | |
| | | *Patella* | 6 | 0 | |
| | | Land snail | 1 | 0 | |
| | | Mammal bone | 0 | 27 | 2 burnt |
| 25 | T22, east end floor | Mammal bone | 0 | 1 | Reese |
| 26 | T Space 16, earth floor with bins | Mammal bone | 0 | 2 | Reese |
| 27a | T42, floor | *Paracentrotus* spine | 1 | 0 | Reese |
| | | Mammal bone | 0 | 1 | Burnt |
| 27b | T42, fill above lepis floor | No fauna | 0 | 0 | |
| 28a | T North Stoa, northwest corner | *Murex* | 0 | 1 | Reese |
| | | Mammal bone | 0 | 1 | |
| 28b | T, North Stoa, sounding below paving | No fauna | 0 | 0 | |
| 29 | Fill, *sottoscala* in J | No fauna | 0 | 0 | |
| 30 | Under P6, green-gray floor | *Murex trunculus* | 1 | 0 | |
| | | *Euconulus* | 1 | 0 | |
| 31 | T22, north half, fill | Fossil oyster | 1 | 0 | Reese |
| 32 | T22, west end, fill | *Euthria* | 1 | 0 | Reese |
| | | *Monodonta* | 4 | 0 | |
| | | *Murex* | 2 | 0 | |
| | | *Patella* | 1 | 0 | |
| 33 | T Space 16, removal of platform | No fauna | 0 | 0 | |
| 34 | T Space 16, northeast North Stoa fill | No fauna | 0 | 0 | |
| 35 | T42, earth floor | *Cypraea* | 1 | 0 | Reese |
| | | Mammal bone | 0 | 1 | |
| 36 | T Space 16, northeast section of North Stoa | No fauna | 0 | 0 | |
| 37a | T, North Stoa, northeast section, east of pier | No fauna | 0 | 0 | |
| 37b | Space 11 fill, T North Stoa | No fauna | 0 | 0 | |
| 37c | T, North Stoa, northwest section, west of pier | No fauna | 0 | 0 | |
| 37d | T Space 10, fill from floor | No fauna | 0 | 0 | |
| 37e | Over pebble court, south T, North Stoa | No fauna | 0 | 0 | |
| 38 | Fill over pebble court, under floor | No fauna | 0 | 0 | |
| 39 | Fill over LM IB floor | No fauna | 0 | 0 | |
| 40 | Fill of *sottoscala*, Space T5B | No fauna | 0 | 0 | |
| 41 | Fill below P3, west end | No fauna | 0 | 0 | |

*(Table 4.14 continued)*

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 42 | Floor under northwest P6 | *Glycymeris* | 1 | 0 | |
| | | *Murex trunculus* | 0 | 1 | |
| 43 | Space 16, northeast section of North Stoa | No fauna | 0 | 0 | |
| 44a | J Corridor 7, dumped fill | No fauna | 0 | 0 | |
| 44b | Space N9, dumped fill | Mammal bone | 0 | 12 | Reese |
| 45 | Fill on slab floor, west J Corridor 7 | No fauna | 0 | 0 | |
| 46a | Surface under North Court 6 | No fauna | 0 | 0 | |
| 46b | Fill over pebble court | No fauna | 0 | 0 | |

Reese = faunal list produced by David S. Reese (pre-1990 excavation)

have a "No fauna" listing under "Species." The lists provided from these earlier trenches did not identify each animal bone. Instead, "Mammal bones" is recorded in the species section, although some of these may actually be identifiable to genus.

The faunal assemblage associated with Building T is minimal in contrast with the sample excavated from Building AA construction fill deposits. There are few deposits yielding significant amounts of fauna in T to warrant speculation into the whereabouts of kitchens, dining rooms, and dumping areas. The exception to this conclusion could be spaces T19 and T42, where significant amounts of shellfish remains were recovered; these are discussed below. Otherwise, meat may not have been prepared and/or eaten in or around Building T. Further investigations can be made by examining fauna recovered from different phases of the building.

The deposits associated with Building T are divided into six different phases:

| | |
|---|---|
| Building T construction (MM III–LM IA Early): | Groups 1–15 |
| Building T continued use (LM IA Advanced): | Groups 16–19 |
| Building T continued use (LM IA Final): | Groups 20–30 |
| Building T continued use (LM IB Early): | Groups 31–42 |
| Building T continued use (LM IB Late): | Groups 43–44b |
| Building T end (LM II): | Groups 45–46b |

Bone and shell remains from the construction of T (Groups 1–15) show a predominance of marine remains. The presence of *Murex* and *Euthria* fragments in these groups suggests the contamination of these deposits with MM II B material. The record of *Glycymeris* in some of these groups also suggests contamination from LM IIIA2 levels. Rutter notes this contamination in some groups (e.g., 9b). The remainder of the material after these species are extracted leaves only a few scraps of bone and single occurrences of shell species. It is doubtful that any of the fauna from these contexts are meaningful to the construction of the building, except in showing that these construction fills are composed of earlier material. There do not appear to be any fauna from these groups that can be directly associated with the construction of T.

Groups 16–19 from the LM IA Advanced period produce one of the most convincing cases for dining in a specific room. Groups 17a and 17b from the floors of Room T19 and adjoining T42 produced almost 600 limpets, 21 mammal bones, and crab remains. These species are certainly edible and were excavated from pure contexts. Other interesting species from these floor deposits include pretty shells like *Columbella*, *Conus*, and *Pisania*. These small marine gastropods are known not for their food value but rather for their attractiveness. Perhaps they were shucked from the rocks along with the limpets, or they fell off the decorations on the clothing of a worker or diner in these rooms.

Fauna from the LM IA Final period of T's continued use reveals patterns identified in adjacent Rooms 19 and 42. In Corridor 20 and adjoining Room 22, a total of 67 mammal bones with seven burnt specimens were found from the floor fill and the floor use. Also, 186 limpets were recovered from the floor deposits. Contemporary floors in Rooms 19 and 42 did not produce mammal bones and limpets. Perhaps this pattern shows that the function of Rooms 19 and 42 changed in the LM IA Final period, and dining continued in the vicinity across the corridor in Room 22. The presence of burnt bones in T20/22 suggests food preparation in the vicinity as well. Burnt bones were not identified from the floor deposits in T19/42.

Almost no bone and shell remains were recovered from LM IB Early deposits. The only notable find that may be associated with this period of use of T is the cowrie shell found on the earthen floor in T42. The cowrie is a lovely shell, often used as an ornament in antiquity as well as in modern times. From the rest of this assemblage, no evidence of meal preparation or refuse is clear from any of the applicable deposits.

Even less bone and shell was recovered from LM IB and LM II deposits. The only exception seems to be in the fill of Space N9 to the west of T. This deposit produced 12 animal bones. Because of the deposit's nature as fill, it is likely that the bones therein date from an earlier period.

In general, meal activity seems to have been restricted to the LM IA Advanced/Final period in the northeast section of T, specifically Rooms 19/42 and 20/22. Unfortunately, much of the West Wing of the building has not been preserved.

## BUILDING P

Building P, with its six galleries, produced fauna from the different phases of construction, use, and abandonment. Only Gallery P3 has been excavated in its entirety, so much of the bone and shell information comes from this space. The interpretation of the building as a shipshed coincides with lack of fauna remains. Clearly, this was not a building meant for human habitation. The bone and shell remains from Building P deposits are listed in Table 4.15.

There is a notable predominance of marine remains from Building P, just as was previously noted for Building T. The main difference is the smaller amount of animal bones overall and the presence of fossil oyster in a good majority of the deposits. *Murex* is still appearing but in fewer numbers, and *Glycymeris* is predominant in many contexts. Most of the deposits in P contain fill from earlier periods and include contemporary material as well. The significant numbers of fossil oyster pieces reflect the digging of foundation trenches, which could be associated with either P or its predecessor T. The earth was clearly repacked after the completion of the construction of P. New surfaces were produced during the use of the building using the recycled fill from previous constructions. The phases of P have been separated by pottery groups as follows:

| | |
|---|---|
| Building P construction fills (LM II–IIIA2 Early): | Groups 47–55 |
| Building P use deposits (LM IIIA2): | Groups 56a–58c |
| Building P use deposits (LM IIIB): | Groups 59–78 |
| Building P end (LM IIIC): | Group 79 |

The construction fills from P represented by the first sixteen pottery groups contain species that have been identified with earlier periods. This finding is to be expected, since construction entailed the mass moving of dirt that merged with contemporary materials. There is a repetition of species in these deposits, which suggests that the fauna are not meaningful or exclusive to the spaces in which they were found. Most species represented here have been recovered from previous fills, or underlying geologic layers containing fossils. *Glycymeris*, as mentioned previously, is also a feature of the LM IIIA2/B period, so it is not surprising to find many of them. One deposit worth discussing is the fill above Room 42 (Group 52h). Here 22 animal bones were recovered, more than in all the other construction fill deposits for P. This fill may have been acquired from another area of the site, perhaps an area used as a dump in the MM period. A more likely scenario is that P levels were mixed with the underlying levels of T during construction. Room T42, as previously mentioned, was found to contain quite a number of bones in the LM IA period. Rutter mentions that this group was contaminated with material from MM III–LM II. It is therefore improbable that this assemblage of animal bones is contemporary with the use of P.

The use deposits of P (Groups 56a–58c) show much of the same pattern of faunal remains as the previous groups. Some fossils and *Glycymeris* appear with some intrusive land snails but not much else to indicate that meal preparation or consumption occurred in or around P during its use.

Later use deposits of P produced more marine remains than were previously found in P. With the exception of Groups 60 and 66, the deposits show much the same species. Group 60, the floor of N4 and Court N6, produced 21 limpets, urchin and fish bits, 99 animal bones,

Table 4.15. Pottery groups from Building P with associated faunal remains (LM IIIA2 Early–IIIB). See Chap. 3.3 for discussion of the pottery groups.

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 47 | Fill below abandonment floor, T5 | Fossil oyster | 3 | 0 | Reese |
| | | *Glycymeris* | 2 | 0 | |
| | | *Monodonta* | 0 | 1 | |
| | | *Murex* | 0 | 1 | |
| | | *Patella* | 8 | 0 | |
| | | *Paracentrotus* spine | 9 | 0 | |
| | | Fish bone | 0 | 11 | |
| | | Mammal bone | 0 | 4 | |
| 48 | Fill below North Court 6 | No fauna | 0 | 0 | |
| 49 | Fill below floor in N12 and N13 | No fauna | 0 | 0 | |
| 50 | Fill below open court N8 | *Euthria* | 1 | 0 | Reese |
| | | *Monodonta* | 1 | 0 | |
| | | Mammal bone | 0 | 9 | |
| 51 | Fill below surface of N9 | *Glycymeris* | 4 | 1 | Reese |
| | | *Helix* | 1 | 0 | |
| | | *Murex* | 1 | 7 | |
| | | *Patella* | 3 | 0 | |
| | | Mammal bone | 0 | 3 | |
| 52a | Fill above T23 | *Eobania* | 1 | 0 | Reese |
| | | *Euthria* | 1 | 0 | |
| | | *Glycymeris* | 26 | 0 | |
| | | *Murex trunculus* | 0 | 1 | |
| | | *Patella* | 12 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | *Helix* | 2 | 0 | |
| | | Mammal bone | 0 | 9 | |
| 52b | Fill above T29, east end of Corridor 20 | Fossil oyster | 1 | 0 | Reese |
| | | *Glycymeris* | 8 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | Mammal bone | 0 | 2 | |
| 52c | Fill between T22 and P1 | *Euthria* | 1 | 0 | Reese |
| | | *Glycymeris* | 8 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Patella* | 65 | 0 | |

(*Table 4.15 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 52d | Fill above T22, east end | Fossil oyster | 1 | 0 | Reese |
| | | Fossil scallop | 1 | 0 | |
| | | *Euthria* | 1 | 0 | |
| | | *Glycymeris* | 9 | 0 | |
| | | *Monodonta* | 1 | 1 | |
| | | *Murex* | 0 | 4 | |
| | | *Patella* | 21 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | *Paracentrotus* spine | 1 | 0 | |
| 52e | Fill N of P1 in south part of T22 | No fauna | 0 | 0 | |
| 52f | Removal of west wall, north of P | No fauna | 0 | 0 | |
| 52g | Scarp cleaning north of P1's north wall | No fauna | 0 | 0 | |
| 52h | Rubble fill above Room 42 | Mammal bone | 0 | 22 | Reese |
| 53 | Fill below first floor in P4 | *Glycymeris* | 7 | 0 | |
| 54 | Construction fill under floor of P5 | Fossil oyster | 2 | 0 | |
| | | *Euthria* | 1 | 0 | |
| | | *Glycymeris* | 3 | 0 | |
| | | *Murex* | 0 | 1 | |
| | | *Patella* | 1 | 0 | |
| | | *Canis* mid rib | 0 | 1 | |
| | | Mammal bone | 0 | 1 | |
| 55 | Fill below first floor in P6 | Fossil oyster | 2 | 0 | |
| | | *Glycymeris* | 1 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex trunculus* | 3 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | *Euconulus* | 1 | 0 | |
| | | *Helix* | 1 | 0 | |
| | | Mammal bone | 1 | 0 | |
| 56a | Floor in east end of P2 | Fossil oyster | 2 | 0 | |
| | | *Glycymeris* | 6 | 0 | |
| | | *Patella* | 2 | 0 | |
| 56b | Floor near east end of P2 | Mammal bone | 0 | 1 | |
| 56c | Floor near east end of P2 | No fauna | 0 | 0 | |

(*continued*)

(*Table 4.15 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 56d | Rectangular pit of northeast corner, P2 | No fauna | 0 | 0 | |
| 56e | Pebbled court surface west of P1 | No fauna | 0 | 0 | |
| 56f | Pebbled court surface south of Court 15 | No fauna | 0 | 0 | |
| 57a | Fill below burnt floor, west end P3 | Fossil scallop | 1 | 0 | |
| | | *Glycymeris* | 6 | 0 | |
| | | *Patella* | 7 | 0 | |
| | | *Ostrea* | 0 | 1 | |
| | | *Eobania* | 1 | 0 | |
| | | *Helicella* | 2 | 0 | |
| | | Mammal bone | 0 | 1 | |
| 57b | Black pebble surface, west end | No fauna | 0 | 0 | |
| 57c | West end P3, fill below plaster floor | No fauna | 0 | 0 | |
| 57d | Floor above burnt earth and pebbles | *Glycymeris* | 10 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex brandaris* | 1 | 0 | |
| | | *Murex trunculus* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | |
| 57e | Floor with walls at west end P3 | *Patella* | 3 | 0 | |
| 57f | Partition wall horizon in center P3 | *Glycymeris* | 3 | 0 | |
| | | *Helicella* | 1 | 0 | |
| 57g | Removal of fill over east end P3 | Fossil oyster | 1 | 0 | |
| | | *Glycymeris* | 3 | 0 | |
| | | *Helicella* | 1 | 0 | |
| 57h | Fill where plaster floor is cut | *Glycymeris* | 1 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | |
| 57i | Fill below first floor P3 | Fossil oyster | 1 | 0 | |
| | | *Sus* mandibular incisor | 0 | 1 | Immature + |
| 57j | Floor associated with anchor bases | *Glycymeris* | 18 | 0 | |
| | | *Ostrea* | 0 | 4 | |
| | | *Pinna* | 0 | 2 | |
| | | *Spondylus* | 0 | 1 | |
| 58a | Fill above terrace surface, north of P | *Glycymeris* | 2 | 0 | Reese |
| | | *Patella* | 2 | 0 | |
| 58b | Fill north of P, over T22 east end | *Glycymeris* | 22 | 0 | Reese |

(*Table 4.15 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | *Monodonta* | 1 | 0 | |
| | | *Murex* | 1 | 0 | |
| | | *Patella* | 20 | 1 | |
| | | Mammal bone | 0 | 4 | |
| 58c | Fill associated with "roasting stand" | No fauna | 0 | 0 | |
| 59 | Floor of J, Room 5A and Corridor 7 | No fauna | 0 | 0 | |
| 60 | Floor of N4 and Court N6 | Fossil oyster | 16 | 0 | Reese |
| | | Fossil scallop | 1 | 0 | |
| | | *Glycymeris* | 9 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex* | 0 | 3 | |
| | | *Patella* | 21 | 0 | |
| | | *Paracentrotus* test | 0 | 1 | |
| | | *Cochlicella* | 41 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | *Helix* | 4 | 0 | |
| | | Fish bone | 0 | 3 | |
| | | *Lepus* | 0 | 1 | |
| | | Mammal bone | 0 | 99 | |
| 61 | Abandonment surface, South Court N6 | Fossil oyster | 0 | 3 | Reese |
| | | *Fasciolaria* | 1 | 0 | |
| | | *Glycymeris* | 1 | 0 | |
| | | *Monodonta* | 19 | 0 | |
| | | *Patella* | 53 | 0 | |
| | | *Helix* | 3 | 0 | |
| | | Mammal bone | 0 | 7 | |
| 62 | Pebbled surface in Space N9 | No fauna | 0 | 0 | |
| 63 | Pebbled court surface in N8 | No fauna | 0 | 0 | |
| 64 | First floor in Rooms N12–13 | No fauna | 0 | 0 | |
| 65 | Second floor of Rooms N12–13 | Fossil oyster | 1 | 0 | Reese |
| | | *Glycymeris* | 1 | 0 | |
| 66 | Final floor in P1 | Fossil oyster | 10 | 0 | |
| | | *Arcularia* | 1 | 0 | |
| | | *Columbella* | 2 | 0 | |

(*continued*)

(*Table 4.15 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | *Glycymeris* | 15 | 1 | |
| | | *Monodonta* | 5 | 0 | |
| | | *Murex trunculus* | 0 | 7 | |
| | | *Patella* | 42 | 0 | |
| | | *Pisania* | 1 | 0 | |
| | | *Eriphia* claw | 0 | 1 | |
| | | *Euconulus* | 1 | 0 | |
| | | *Helix melanostoma* | 1 | 0 | |
| | | *Ovis/Capra* mid humerus | 0 | 1 | Immature + |
| | | *Ovis/Capra* mid metatarsus | 0 | 2 | Immature + |
| | | *Ovis/Capra* fourth premolar | 0 | 1 | > 1 year |
| | | Mammal bone | 0 | 3 | Immature + |
| 67a | Final floors at east end of P2 | Fossil oyster | 2 | 0 | |
| | | *Charonia* | 0 | 1 | |
| | | *Glycymeris* | 6 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | *Spondylus* | 1 | 0 | |
| | | *Helix melanostoma* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | Immature + |
| 67b | Final floor at west end of P2 | No fauna | 0 | 0 | |
| 67c | Lepis floor at west end of P2 | *Glycymeris* | 5 | 0 | Reese |
| 67d | Surface with porous working chips | No fauna | 0 | 0 | |
| 68 | Initial floor in P3, over anchors | Fossil oyster | 1 | 0 | |
| | | *Glycymeris* | 2 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex trunculus* | 1 | 0 | |
| | | *Ostrea* | 1 | 0 | |
| | | *Patella* | 3 | 0 | |
| 69a | Second floor in P3, eastern part | Fossil oyster | 3 | 0 | |
| | | *Glycymeris* | 3 | 0 | |
| | | *Monodonta* | 3 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | *Euconulus* | 1 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | Immature + |

(*Table 4.15 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 69b | Second floor in P3, western part | Fossil oyster | 0 | 2 | |
| | | *Bittium* | 1 | 0 | |
| | | *Glycymeris* | 4 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Ostrea* | 0 | 4 | |
| | | *Patella* | 3 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | Immature + |
| 70a | Final floor in P3, Trench 83A | Fossil oyster | 0 | 1 | |
| | | *Glycymeris* | 14 | 0 | |
| | | *Monodonta* | 5 | 0 | |
| | | *Murex trunculus* | 1 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | *Sepia* | 1 | 0 | |
| | | *Helix aspersa* | 1 | 0 | |
| | | *Ovis/Capra* cf. mid longbone | 0 | 1 | Immature + |
| 70b | Final floor in P3, Trench 83C | Fossil oyster | 0 | 3 | |
| | | *Glycymeris* | 1 | 0 | |
| | | *Helix melanostoma* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | Immature + |
| 71a | Abandonment surface, P3 north half | Fossil oyster | 1 | 0 | |
| | | *Glycymeris* | 3 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | *Helix melanostoma* | 2 | 0 | |
| 71b | Abandonment surface, P3, south half | Fossil oyster | 1 | 0 | |
| | | *Glycymeris* | 1 | 0 | |
| | | *Monodonta* | 2 | 0 | |
| | | *Paracentrotus* test/spines | 0 | 60 | |
| | | *Helix melanostoma* | 2 | 0 | |
| | | Mammal bone | 0 | 1 | Immature + |
| 72 | Fill between two floors in P5 | Fossil oyster | 1 | 0 | |
| | | *Glycymeris* | 7 | 0 | |
| | | *Patella* | 1 | 0 | |
| 73a | Final floor in P5 | Fossil oyster | 1 | 0 | |

(*continued*)

(*Table 4.15 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| | | *Glycymeris* | 2 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Patella* | 5 | 0 | |
| | | *Helicella* | 2 | 0 | |
| 73b | Use fill of P outside P5 | *Glycymeris* | 2 | 0 | |
| 74 | Abandonment surface in P5 | Fossil oyster | 0 | 3 | |
| | | *Glycymeris* | 2 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Euconulus* | 1 | 0 | |
| | | *Helicella* | 1 | 0 | |
| | | *Helix melanostoma* | 15 | 0 | |
| 75 | Fill between floors in P6 | Fossil oyster | 0 | 2 | |
| | | *Astraea* | 1 | 0 | |
| | | *Glycymeris* | 8 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex trunculus* | 0 | 2 | |
| | | *Patella* | 1 | 0 | |
| 76 | Final floor in P6 | Fossil oyster | 0 | 3 | |
| | | *Euthria* | 1 | 0 | |
| | | *Glycymeris* | 4 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex* | 1 | 0 | |
| | | *Patella* | 1 | 0 | |
| | | *Euconulus* | 1 | 0 | |
| | | *Oxychilus* | 1 | 0 | |
| 77 | Fill of terrace in front of P6 | Fossil oyster | 0 | 2 | |
| | | *Arcularia* | 1 | 0 | |
| | | *Euthria* | 1 | 0 | |
| | | *Glycymeris* | 5 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Murex trunculus* | 0 | 2 | |
| | | *Euconulus* | 3 | 0 | |
| | | *Helicella* | 2 | 0 | |
| | | *Helix melanostoma* | 1 | 0 | |
| | | Mammal bone | 0 | 1 | |

(*Table 4.15 continued*)

| Pottery Group | Location | Species | Complete | Fragments | Comments |
|---|---|---|---|---|---|
| 78 | Wash levels between N6 and Q | Fossil oyster | 1 | 1 | Reese |
| | | *Cerithium* | 1 | 0 | |
| | | *Glycymeris* | 11 | 0 | |
| | | *Monodonta* | 1 | 0 | |
| | | *Patella* | 44 | 0 | |
| | | *Spondylus* | 1 | 0 | |
| | | *Helix* | 2 | 0 | |
| | | Mammal bone | 0 | 21 | |
| 79 | Uppermost levels above J | No fauna | 0 | 0 | |

Reese = faunal list produced by David S. Reese (pre-1990 excavation)

and many land snails. The presence of land snails could indicate a dump of some kind, since snails are attracted to carrion or rotting vegetation. Building N, considered a possible administrative building associated with P in its early stages therefore exhibits evidence of human habitation, or at least dumping activity. Group 66, the final floor in P1, also produced 42 limpets, a crab claw, and sheep/goat bones. These contexts are the only cases in which evidence for eating or discarding meal refuse was found in P or N. These remains could be contemporary with the structures or represent squatter activities immediately after the building was abandoned.

The wash levels and the LM IIIC deposits reveal nothing remarkable about the local inhabitants in the area at the time. Limpets, *Glycymeris*, and 21 animal bones in the wash zone between N6 and Building Q (Group 78) resemble the assemblage found in adjacent N6 from a slightly earlier date.

## Conclusion

The faunal remains from the Southern Area at Kommos tell us several things about the occupation of the site.

1. The site was not intended for extensive human domestic habitation after the MM IB period.
2. The MM IB deposits contain the largest concentrations of animal bone, suggesting that either the Southern Area was inhabited at that time or that dumping from the Minoan town to the north occurred here.
3. Buildings AA, T, P, and N were likely public buildings.
4. The massive movement of earth during the construction of the large buildings resulted in a mixing of levels, which hinders clear interpretation of spaces.

5. Eating activity or meal refuse was found in significant quantities in Rooms T19, T20, T22, and T42, dating from the use of T.
6. Eating activity or meal refuse was found in significant quantities in Room N4, Court N6, and the final floor in P1, dating from the period during or immediately after the use of P.
7. *Murex* occurs throughout the Southern Area, clearly associated with an early MM dye industry.
8. This dye production industry at Kommos is one of the earliest installations for Royal Purple textile manufacture in the ancient world.
9. *Murex* was melted into lime and used secondarily in Central Court paving in the MM III or early LM IA period.
10. Waterworn *Glycymeris* was found throughout the site in the LM IIIA2/B period, probably deposited initially through natural events and later collected by site inhabitants.
11. The exclusive presence of *Helix melanostoma* among *Helix* species up until the LM IIIA2 indicates an agricultural community of modest proportions.
12. The exclusive presence of *Helix aspersa* in the Historic period indicates a long-term consequence of agriculture in the area.
13. The inhabitants of Kommos exploited domestic and marine animals for food and labor.
14. Settlers came to Kommos with domestic animals also found at other sites in Crete.

Although the faunal assemblage from the Southern Area of Kommos is not extensive, much about the use of the site and its inhabitants can be learned from a study of temporal and spatial contexts.

## Notes

1. J. W. Shaw 1973a: 45–47 (double axes; see also Blitzer 1995: **M 154** for a double ax from the Kommos hillside); 47–49 (picks, mattocks, adzes); 52–55 (hammers); 55–58 (toothed saws); 70–75 (chisels).

2. **3** (a knife tip), **8** (a chisel), **11–12** (nails), and **28–29** (strips); **16** (rod fragments) was found at the western end of the same space.

3. We are indebted to Kathy Hall, conservator, for these observations.

4. For nails from other sites see J. W. Shaw 1973a: 74 n. 3. Recently, however, nails of LM II date as long as 15 cm have been reported from the Unexplored Mansion at Knossos (Popham et al. 1984: pl. 196 [h, i, j], 203 [**10–14**]). Other nails from Kommos are described in Blitzer 1995: **M 100** (B 68) and **M 101** (B 69), the largest of which is 2.9 cm long. Large iron spikes 15–20 cm long were used during the Greek period to secure the timbers of Temple C (J. W. Shaw 2000: chap. 5.8.)

5. These strips are probably copper rather than bronze, for which see Table 4.1. For other strips from the Southern Area see Blitzer 1995: **M 108** (B 94), **M 118** (B 133), **M 123** (B 146) and her pls. 8.86, 8.107. The author is indebted to Niki Holmes Kantzios for her careful cataloguing of many of the strips and some of the other bronzes.

6. Similar strips of metal (copper?) were recovered at Akrotiri on Thera (Michailidou 1995: 173, pl. 24a) where it is suggested that they might have been used to bind molds but could have been used for other things as well. H. W. Catling and E. Catling note those from the Unexplored Mansion at Knossos as well as from the Menelaion near Sparta, identifying them as "mould wire" (1994: 218). No crucibles, slag or molds, representing actual metalworking, however, were found in Room F of Building T. Evely (2000: 362) mentions such "binding" strips also from Malia,

Gournia, and Pseira. Those analyzed (Gournia, Knossos, Kommos, and Malia) are of copper, without tin.

7. For crucibles see also Evely 2000: 346–52, which incorporates new information from Knossos and elsewhere.

8. The descriptions of the crucibles discovered through 1985 are taken largely from Blitzer 1995, but sometimes with added information on date and stratigraphy. Cecile Oberweiler of the Université Paris I—Sorbonne has made suggestions that have been incorporated in the text.

9. For those from Greek contexts, some no doubt Minoan, see *Kommos* IV.

10. Through Trench 65B1, through 1985. Dabney 1996a: 244–62.

11. To these should be added Dabney 1996a: **152–53**.

12. Although some of these types were found in House X, north of the east-west road, they were not found within the area circumscribed by the outline of Building T (the "Southern Area" here).

13. Other uses such as fishing cannot be excluded. In 1996 a Pitsidia fisherman, Theocharis Spinthakis, recovered loomweight C 11063 (in Pl. 4.15) from the sea. It had been caught up in one of his nets at a depth of 40 m off the point of land directly west of Kaloi Limenes and south of Matala (at "Kephala"). As far as we know, there is no ancient settlement in the immediate area, so the possibility that it was originally used as a line or net weight is increased. See also *Kommos* I (2): 381. The weight is probably Minoan, for its size is similar to our MM **14**, **19**, and **26** here. Its fabric, with dark gray angular inclusions, matches that of the same three, so it may be MM as well. Statistics for this loomweight from the sea (C 11063) are given here in the form of the catalogue in Table 4.2: Preserved: 95%; h 7.75; w 7.6; th 2.3; wt 118 g; d of hole 1.8. Holes: 1; G: N; F: N; T: N; P: N; I: N. Color of exterior and interior clay: 5YR 5/5. Inclusions: 30%. For the probable use of loomweights for fishing, see also Powell 1996: 116–18 and figs. 74, 76.

14. The number 183 is derived as follows. There are 167 listed in Dabney, but this number should be reduced by 1, to 166, since her **133** (C 3545) was found by us to join her **140** (C 3193, our catalogue number **57**). To this 166 should be added the 31 discovered in the Southern Area after 1985, giving a site total of 197. Our total of 183 in the text does not include 14 found in connection with Roads 17, 33, and 34 (Dabney 1996a: **1**, **57–58**, **75–78**, **100**, **105**, **106**, **112–14**, **163**), for our list focuses on the interiors of the civic structures. To our catalogue total here of 64 from the Southern Area should be added Dabney's **53**, **152**, and **153**, giving the total of 67 cited in the text.

15. These are similar to **13**, **15**, and **17** in Group 2.

16. Entry taken from Dabney 1996b: 268.

17. Catalogued by Niki Holmes Kantzios.

18. She also lists a number from the Southern Area, which are not included here. The few examples of chipped stone (CS) from the Southern Area are dealt with in the same chapter. The dates of those published by her and listed in the catalogue below have often been changed, since the archaeological contexts are better understood at this point.

19. The following three items were not part of the original Blitzer typology but were published separately by Whittaker (1996a: 321–23), where she notes that they may have been for offerings or for games. They are included here for the sake of completeness.

20. Schwab 1996: **42** (S 283).

21. Other fragments of Minoan vases were found in Greek contexts in the Southern Area. None were found in interiors, so they were presumably not in reuse. They are Schwab 1996: **2**, **14**, **27**, **44**, **54**, **57**, **69**, **64**, and **78**. We found **31** when building a wall along the western periphery near Building T, Room 5. It appeared below the level of the pebble court, so it may well belong to the first group associated with MM Building AA.

22. For a valuable review of the full range of "offering tables," see Gesell 1985: 15, 33, 51, which is particularly useful, as it places their use both contextually and diachronically. Here I also take the opportunity to thank those who helped me with various aspects of this study: P. Muhly and P. Militello for their expert opinions on the subject; conservators Cap Sease, Barbara Hamann, Kathy Hall, Élise Alloin, as well as Teresa Hancock for her assistance with the preparation of illustrations, tables, and charts.

23. A particularly useful technical study is that of tables found at Phaistos (Militello 2001: 182–84). For tables characterized by a tall pedestal, see Platon and Pararas 1991; and for My-

cenaean examples, see Polychronakou-Sgouritsa 1982.

24. For the use of tables as hearths, see Metaxa-Muhly 1984.

25. **PT1–PT2** were drawn by G. Bianco, the remainder by Julia P. Pfaff.

26. **PT1–PT3**, and **PT7** were photographed by Edwin Burke, the remainder by Taylor Dabney.

27. Reconstructions by the author redrawn by G. Bianco.

28. I am indebted to workman Euripides Lykardopoulos for his carrying out the preliminary excavation with care, and in the uncomfortable position of lying on his back with his head facing up in the tight spot under the LM III wall. The pieces of the table were eventually retrieved by attaching them to a backing of gauze before removing them. This delicate operation was undertaken by conservator Kathy Hall, who also consolidated what was left from this table and who constructed a mount as support for the piece with the painted surfaces.

29. For such a design on pottery, see Betancourt 1985a (on the book jacket), an MM II cup from Kommos.

30. I found the comments in the following two publications to be the most helpful: Xanthoudides 1922: 15–16, and Militello 2001: 182–84, 199–200.

31. The only match I could find is a stone tripod object found on Thera, which, however, is not flat on top and has been described as a grinder by the excavator (Marinatos 1968: 57–58, figs. 84–88).

32. See Militello 2001: 183 n. 224, for a listing of types of offering tables from these areas and what appears to be a usual range of diameters, namely, 30.0–60.0.

33. Information provided in Doumas 1992: 183; measurements given in the caption for figs. 142–44.

34. The shape seems to me to most resemble Militello 2001: 171, fig. 40, 1c, which is a drawing reconstructing a number of types. For painted table feet from Phaistos, see pls. XII, 1–2, col. pls. B, 3, 5 and C, 5, 10, and 11. Of these, the last two feature abstract patterns, one resembling that on **PT27** from Kommos.

35. The shape is not dissimilar to that suggested for some examples from Phaistos (Militello 2001: 171, fig. 40, 2a).

36. The estimate is not far off the lower part of the range (15.0–20.0) quoted for tables (even of the round kind) from Nirou Khani (Xanthoudides 1922: 16).

37. For such decoration, see two examples from Thera, with the term used in the captions of their decoration: Marinatos 1971: pls. 81 and 82.

38. See, for instance, examples from the palace at Phaistos (Militello 2001: pls. VIII 6–7).

39. See examples from Phaistos (Militello 2001: pl. C, 5) and some of the tables from Thera noted above.

40. As can be seen in an example from Mycenae, where a helmet was depicted on the leg of the table (Wace 1921–23: 224–26, pl. XXXVII, a and d).

41. See Baker 1966: 245 n. 12. The reference was obtained from Muhly 1996: 204.

42. For a decoration on feet that includes abstract designs and even imitations of variegated stones, see examples from Phaistos in Militello 2001: pl. XII, 1–2, pl. B, 3, 5, pl. C, 11.

43. For the particular shape see the tables from Archanes in Sakellarakis and Sapouna-Sakellarakis 1997: vol. II: 505, fig. 494.

44. The reconstruction offered by Militello for a type of table found at Phaistos that comes closest in shape to the Kommos Type A was very helpful (2001: 199–200 and pl. XVI, 1–5).

45. My main evidence for this comes from loose fragments of **PT14**, which are definitely part of the table's underside.

46. Muhly 1996: 197–206.

47. Militello (2001: 184). That dowels were used on other occasions in association with plaster is suggested by similar impressions noted by Cameron in wall revetment that consisted of thick layers of plaster, leading him to the conclusion that the purpose was to help prevent a collapse of the thick revetment. This observation and a photo of an example were conveyed in the past to J. W. Shaw (1973a: 215, and 212, fig. 243).

48. The feet, according to Muhly (1996: 198), were attached to the convex underside of the wooden tables by means of tenons, mortises, and pegs.

49. According to a recent communication from Militello, the clay cores of tables from Phaistos were never found adhering to the interior of the plaster coating. The use of such cores is attested there by loose fragments in the storeroom boxes with finds from the old excavations of a mixture made of mud, little broken stones, and pebbles.

Among the best-preserved tables in Crete are those from Nirou Khani and at Archanes, to be discussed below.

50. For such a possible role, see M. C. Shaw 1986.

51. See Sakellarakis and Sapouna-Sakellarakis 1997: vol. I: 84, fig. 65. Although this is a speculative thought, I would like to suggest that if the find spot of the actual table **PT9** is close to where the one preserved piece was found, directly west of the LM III wall that separates Loci 35/P4–36/P5, the table may have been positioned on the little plaster platform, set centrally at the entrance to Locus 36/P5.

52. This view was argued recently by the present author, along with the possibility that there may have been a second storey with colonnaded balconies over both the Kommos stoas, the purpose of which would have been to increase viewing capacity, especially for those who wished or had to watch such events from more private quarters (M. C. Shaw 2003a). For the theatrical aspect of Minoan ritual and spaces from which it was formally "watched," see: La Rosa 2000c: 137–52; Palyvou 2002: 167–77, pls. LVI–LIX (with special emphasis on the role of the Central Court.

53. That the stoas at Kommos were properly appointed to receive people of some importance and in some numbers is clear both by their impressive depth (5.50–5.60 m) and their mural decoration, with its imitations of fancy stonework in a dado of panels, and its painted floors (Chap. 2).

54. Rutter 2004. On the other hand, the dining itself, as I propose in Chap. 2.2 here, may have taken place in Room 19, where the greatest deposit of food debris was found.

55. As, for instance, in the so-called Temple at Malia in MM II (Rutkowski 1986: 159–61), and in the LM III shrines at Gournia and at Knossos, respectively, in Gesell 1985: 90–92, 200, fig. 118 and 72, 200, fig. 119.

56. Here, I agree with P. Muhly (pers. comm., March 13, 2003) that these tables do not by themselves have a religious function, exclusively as offering tables. Her arguments can be found in her discussion of the little wooden tables from Mycenae, as well as one from Akrotiri at Thera, reconstructed from its imprint in the ash, that may have been used in banquets (Muhly 1996: 202–4).

57. Small quantities of agricultural produce such as fruits and grains may have been placed on the plaster tables (as suggested in Xanthoudides 1922: 16).

58. Xanthoudides 1922: 8 and 15–16, figs. 8, 12, in Rooms 17 and 18. For a handy plan of the building, see Gesell 1985: 116, fig. 60. For a possible tripartite shrine set in the court, see J. W. Shaw 1978a: 446 n. 32.

59. Xanthoudides 1922: 16.

60. The tables were found in Hall 10. For a plan and other information, see Sakellarakis and Sapouna-Sakellarakis 1997: vol. I: 79, 98–100, and vol. II: 504–5.

61. Militello 2001: 87, 91, 94–97. For the presence of MM II and III sherds in some of the layers containing the plasters, see his p. 92.

62. For a discussion of this theory, see La Rosa 1998–2000 and Militello 2001: 97. For more specific information about the archaeological context and a catalogue of the tables concerned, see Militello 2001: 91–96.

63. After several discussions, some as recent as May 2005, Militello himself has come to agree that this is a definite possibility, with such use occurring both in MM II and MM III (pers. comm., May 10, 2005).

64. Sakellarakis and Sapouna-Sakellarakis 1997: vol. I: 141, drawing 30.

65. Sakellarakis and Sapouna-Sakellarakis 1997: vol. II: 504–5, fig. 494.

66. Xanthoudides 1922: 2–3, Plan A.

67. For the earlier publication, see J. W. Shaw and M. C. Shaw 1996: 282–302 and a table (on p. 291) that tabulates the provenances of all pieces known at the time from both the town and the area then exposed to its south. Excluded from that publication were figurines from House X, which was still incompletely excavated and which will be published in a separate volume. Some examples from that house have appeared in the meantime in a preliminary excavation report (J. W. Shaw and M. C. Shaw 1993: 131–61).

68. J. W. Shaw and M. C. Shaw (eds.) 1996: 291, table 4.2

69. For Minoan appliqués, see Foster 1982.

70. J. W. Shaw and M. C. Shaw (eds.) 1996: 301, pl. 4.40.

71. J. W. Shaw and M. C. Shaw (eds.) 1996: 300.

72. J. W. Shaw and M. C. Shaw (eds.) 1996: 301 (quoting a parallel), pls. 4.40 and 4.44.

73. J. W. Shaw and M. C. Shaw (eds.) 1996: 295, pls. 4.36, 4.42.

74. J. W. Shaw and M. C. Shaw (eds.) 1996: 299, pls. 4.38, 4.44.

75. J. W. Shaw and M. C. Shaw (eds.) 1996: 301, pls. 4.40, 4.44.

76. J. W. Shaw and M. C. Shaw (eds.) 1996: 300–301, pl. 4.40. For the size I have in mind, see a bull askos from Pseira (Betancourt 1985: pl. 19 B).

77. J. W. Shaw and M. C. Shaw (eds.) 1996: 291, 293; 2000, 171 n. 43.

78. For the temples, see J. W. Shaw, chap. 1, in J. W. Shaw and M. C. Shaw (eds.) 2000: 1–100.

79. C 539 has been published by Betancourt (1990: 155, cat. no. **1205**, fig. 49), where it was interpreted as wearing a kilt, although the bulging part above the "kilt" may be part of the costume, as in **Sc7**, rather than evidence for Minoan obesity. This piece was found in one of the houses on the Hillside Area of the town of Kommos, in a dump that accumulated from LM I through LM III times. The date of the specific context is not clear, since the pieces were discovered while the side of a wall associated with the dump was being cleaned.

80. The discussion here concentrates on the figurines. The scanty number of the appliqués, as well as the fact they were found detached from the surface to which they were originally attached, allows little room for interpretation, further than what was offered above.

81. M. C. Shaw, Chap. 2.4.

82. J. W. Shaw and M. C. Shaw (eds.) 1996: 288–94.

83. M. C. Shaw 2004.

84. I would like to express my gratitude to Joseph and Maria Shaw for support and interest through my twelve years of working with them. I would not have had the pleasure of the Kommos experience or the chance to examine this material without their invitation. They also provided valuable feedback on ideas presented here as well as resources with which to perform the faunal analyses and experiments over the years. Jeremy Rutter and Aleydis Van de Moortel provided information and engaging discussion about pottery sequences and deposits and space usage in the southern excavations at Kommos. I am grateful for their input and camaraderie. To Niki Holmes Kantzios, I am indebted for her organization of all materials. Leda Costaki and Marie Goodwin also provided logistical support and supplies from the apotheke in Pitsidia in later years. William Taylor Dabney provided some photographs, and Kathy Hall, Alexander Shaw, and others helped in the tedious task of sorting sieved material. The *Murex* experiments, generously funded by a fellowship from the INSTAP foundation in 2001, were a success thanks to the assistance of Elizabeth Watson. I am grateful to Malcolm H. Wiener for his interest in my work and his generous support through the Wiener Laboratory of the American School of Classical Studies and INSTAP. John Younger was helpful in answering queries regarding Minoan seals. I am indebted to the people of Pitsidia for information on local fauna and for support. I also wish to acknowledge my dear husband, Michael Cosmopoulos, who kindly read through sections of this manuscript and offered comments, as did Joseph and Maria Shaw, and Jeremy Rutter.