

Spondylus gaederopus tools and meals in Central Greece from the 3rd to the early 1st millennium BC

Irini C. Veropoulidou
Aristotle University of Thessaloniki, Greece

Abstract

This paper discusses the Spondylus gaederopus shells from two sites on the North Euboean Gulf in Central Greece. These are the Early Bronze Age settlement of Proskinas, situated 2 km from the coast and the Middle Bronze Age to Early Iron Age site of Mitrou, a small tidal islet in the Bay of Atalanti. The quantitative and qualitative study of the many molluscan species showed that shells were gathered for different purposes, i.e. food, purple-dye production, jewelry and tools. There was a special preference in the gathering of Spondylus gaederopus, however, for eating and for tool making. At the site of Proskynas, Spondylus not only forms the main species of the assemblage (316 out of 784 shells), but there is also clear evidence that it was gathered beach-worn to serve as scraping, scaling or percussion implement. The situation is different at the site of Mitrou; there, Spondylus is in quantity the third species in the assemblage (749 out of 6325), but was primarily gathered for food and was only secondarily used as a tool. The paper explores the choronological and spatial data of the two sites, which indicate the differences in Spondylus gaederopus usage. It will also try to pinpoint differences in the perception and use of Spondylus between the Neolithic and Bronze Age and between Central and Northern Greece.

Introduction

Artifacts, such as beads, pendants, annulets and rings made of *Spondylus gaederopus* and dated to the Neolithic period, are well known to the Aegean area (Chiraldi et al. 2005; Karali-Yiannakopoulou 1992, 1993; Kyparissi-Apostolika 2001; Miller 1997). According to existing evidence, the first ornaments made of *Spondylus* appear in the Early Neolithic period at many sites in Greece, while in the course of the Late Neolithic *Spondylus* ornament manufacture and trade with South-Eastern and Central Europe intensifies, climaxes, and consequently disappears (Borrello & Micheli 2005; Comsa 1973; Rodden 1970; Seferiades 1995; Siklosi 2004:12-14, 21; Tripkovic 2006). The overwhelming amount of *Spondylus* raw material and artifacts comes from northern Greece, for reasons usually related to its

strategic geographical position for the distribution of artifacts (Karali-Yiannakopoulou 1993, 1999; Miller 1997:279). The end of the Neolithic signals the termination of ornament production at almost all coastal sites probably due to the advent of more precious materials, such as exotic stones and metals that were more amenable to Bronze Age elite control (Halstead 1993). The investigation of *Spondylus* phenomenon is thorough and sophisticated, concerning for example raw material procurement and origin (Rodden 1970; Shackleton & Elderfield 1990), stages of ornament manufacture (Tsuneki 1988), trade routes (Muller 1995; Seferiades 1994 (1995); Todorova 2000), as well as ornament use, consumption and discard (Ifantidis 2006; Nikolaidou 1997, 2003; Reese 1987; Tripkovic 2006).

In the long list of published shell assemblages from the Bronze Age Aegean, the discussion of *Spondylus* material is particularly short. With some notable exceptions, (Becker 1996; Karali-Yiannakopoulou 2004; Prummel 2001, 2005; Reese 2006), most publications just report the number of specimens found. By reading between the lines, one realizes that not worked *Spondylus* shells are supposed to represent food refuse, even though no specific comments are made on the condition of shells, their size, the traces on the valves or the context of findings. The presence of artifacts is given a brief reference, but detailed presentation and discussion of *Spondylus* as part of the material culture are usually missing (but see Reese 1987).

Taking into consideration that research on *Spondylus* use during the Bronze Age is under-represented, this paper discusses the occurrence of the shell in Bronze Age Greece. The emphasis is placed on the material from two sites on the north Euboian Gulf in Central Greece: Proskynas and Mitrou. I do not intent to argue however, that the material from these sites stands as a *sui generis* phenomenon. In fact, the aim of the paper is to show that contrary to predominant views, *Spondylus* was still used in the Aegean during the Bronze Age to serve various domestic needs and community requirements. Before proceeding with the analysis of shells and the interpretation of the material from the two sites, a brief comment on *Spondylus* findings from Bronze Age sites in Greece is considered necessary.

***Spondylus* in Bronze Age Greece**

The beginning of the Bronze Age in the third millennium attests a decrease in the use of shells and especially *Spondylus* (Karali 1999). Regarding northern Greece, except for the site of Skala Sotiros on the island of Thassos (Karali-Yiannakopoulou 1995:390-392), the other

Early Bronze Age sites produced only few *Spondylus* shells, mainly not worked¹ (Karali-Yiannakopoulou 1981, 2002) (Figure 1). This is peculiar considering that a considerable amount of other shell species occurs and the fact that *Spondylus* was intensively exploited in the area during the Neolithic. The use of other highly esteemed materials and the decline of the *Spondylus* trade with the Balkans are perhaps the most likely explanations for this phenomenon, as I mentioned above ((Borrello & Micheli 2005:79; Halstead 1993:608). However, the fact that *Spondylus* was mainly regarded as raw material for ornaments and possibly a tradable commodity, while other uses were not taken into account during the Neolithic and the Early Bronze Age in this area, as seem to have happened in southern Greece, needs further investigation.

A decrease in shell use is also noted at other parts of Greece, with the exception of the third millennium settlements of Poliochni and Markiani on the islands of Lemnos and Amorgos respectively (Sorrentino 1997; Karali 2002). Regarding *Spondylus*, however, a variety of artifacts is reported from mainland Greece, the Aegean islands and Crete, but the numbers are significantly low (Karali 1999:18-25). The most common finding seems to be a kind of small "pestle" or spool (Hood 1982; Renfrew 1985), while other artifacts include scoops and spatulas, shallow vessels and some possible tools (Becker 1996), (Karali 2005; Karali-Yiannakopoulou 2001, 2006). There are only few sites with an adequate number of *Spondylus* artifacts, such as the settlements of Lerna in the Peloponnesus (Gejvall 1969) and Lithares in Central Greece (Reese 1985 d).

Moving to the Middle and Late Bronze Age in the 2nd millennium BC, published shell assemblages indicate an increase in the quantity of *Spondylus*. The few excavated sites from northern Greece, namely Ayios Mamas in the Chalkidiki peninsula (Becker 1996) and Thessaloniki Toumba (Veropoulidou 2002), indicate a renewal in *Spondylus* exploitation, but compared to central and southern mainland Greece the quantities were again restricted. In the northern cases, *Spondylus* was consumed as food. In the south, as for example at Lerna (Gejvall 1969), Midea and Mycenae in the Argolid (Reese 1998), Ayios Stefanos in Laconia (Reese pers. com.), and Lefkandi on Euboia (Reese 2006), a sufficient quantity of *Spondylus* is mentioned. Most specimens seem to be not worked and theoretically represent food refuse, but some possible tools are also reported. Crete offers the scantier evidence, where *Spondylus*, apart from the site of Chania, is a rare finding (Reese 2006).

¹ We must note the Sitagroi and Dikili Tash sites in the Drama plain in Northern Greece, where the use of *Spondylus* ornaments is testified during the Early Bronze Age (Nikolaidou 1997:179, 181).



Figure 1. Map of Greece with sites mentioned in the text.

The overview of the evidence presented above suggests that *Spondylus* constituted a common commodity during the Bronze Age, albeit used differently than in the Neolithic period and probably in a smaller scale. Therefore, it appears that a gap exists in the discussion of this aspect of Bronze Age material culture. I believe that a detailed and contextual analysis of *Spondylus* finds could provide insights into the mode and the scale *Spondylus* shells were exploited during this period. Furthermore, such a study could inform on the community needs that *Spondylus* exploitation was focused on, the possible cultural preferences related to its use and could make suggestions regarding the social and economical aspects of the use of the material.

Early Bronze Age – The site of Proskynas

The settlement of Proskynas (Zachou 2004) is located on a low, extended hill in the eastern part of Central Greece, almost 2,5 km from the present shoreline, east of the bay of Atalanti. The surrounding landscape comprises a variety of ecological zones, in an area favorable for living. The earliest habitation traces date to the Final Neolithic period. The main habitation level, dates to the Early Helladic² IIA period (2650-2450/2350 BCE³). Three free-standing, rectangular buildings with storage and food processing facilities have been excavated along with some open areas with evidence of everyday and industrial activities some of which may be related to pottery manufacture. In the Middle Helladic period, after a considerable gap in habitation (2050/2020-1680 BCE) a new settlement was established further to the north-west while part of a tumulus with children burials was unearthed in the area of the former EH settlement.. The final phases of occupation belong to the Late Helladic IIIA1 (1390-1370 BCE) and IIIB2 periods (1310/1300-1190/1180 BCE). A small, terrace wall was constructed and used during these phases.

The shell assemblage dated to the Neolithic and EH IIA phase consists of 784 intact and fragmented mainly marine shells⁴. The 56% of the material, namely *Ostrea edulis*, *Cerastoderma glaucum*, *Murex trunculus*, *Cerithium vulgatum* and *Arca noae*, probably represents food refuse; however, the small amount indicates only a supplementary role in diet. Ornaments made of shells are only a few; there are four *Cerastoderma glaucum* perforated valves and two pendants, one *Conus mediterraneus* and one *Glycymeris*.

The most common shell find in EH IIA deposits is *Spondylus gaederopus*, which represents 40% of the total assemblage; 274 intact or near intact valves and 34 fragments were found (NISp: 308). More than half of the valves (54%, NISp: 168, R: 98, L: 38) were collected worn, either water or beach-worn. The spines and all the sculpture of the outer surface of the left valves are naturally grounded, whilst the surface of the right valves is spongy and in some cases sharp. In other examples, water, sand and sun action resulted in finely smoothed edges and the loss of shell's natural characteristics. Only in few specimens the outer color is preserved. Most of the valves have a medium to large size, while some massive right valves are also present. The wear indicates that a portion of *Spondylus* must have been collected

² Abbreviations: EH: Early Helladic, MH: Middle Helladic, LH: Late Helladic

³ For absolute chronologies of EH and MH periods see (Rutter 1993:756), while for LH see (Shelmerdine 1997:540).

⁴ The molluscan remains identified with (Abbott 1989), (Pfleger 1999) and (Peppe & Goto 1991), (Peppe & Goto 1993). The analysis followed the norms given by (Claassen 1998).

during beach combing; however, the dimensions and the quantity of large right valves suggest also fishing from significant depths.

The 85% of the *Spondylus* material (235 valves) has traces of chip and cut, grounding or friction along the ventral lip (Figure 2). These cut marks affect either the whole margin, from one side of the hinge to the other, or only a part. It seems that cut marks are related to shell morphology, as they are situated along the most fragile part. Besides, the dry condition of worn shells speeded up the breaking of the hard and solid material (Miller 1997:92). According to macroscopic analysis, cut marks were divided into three main categories (Table 1): 31% are chipped valves (Figure 1a); 34% are heavily cut and grounded (Figure 1d), while 20% are partially polished (Figure 1b, e). The rest 16% consist only of hinges, that is what was left from with the heavily cut lips of the valves (Figure 1c).

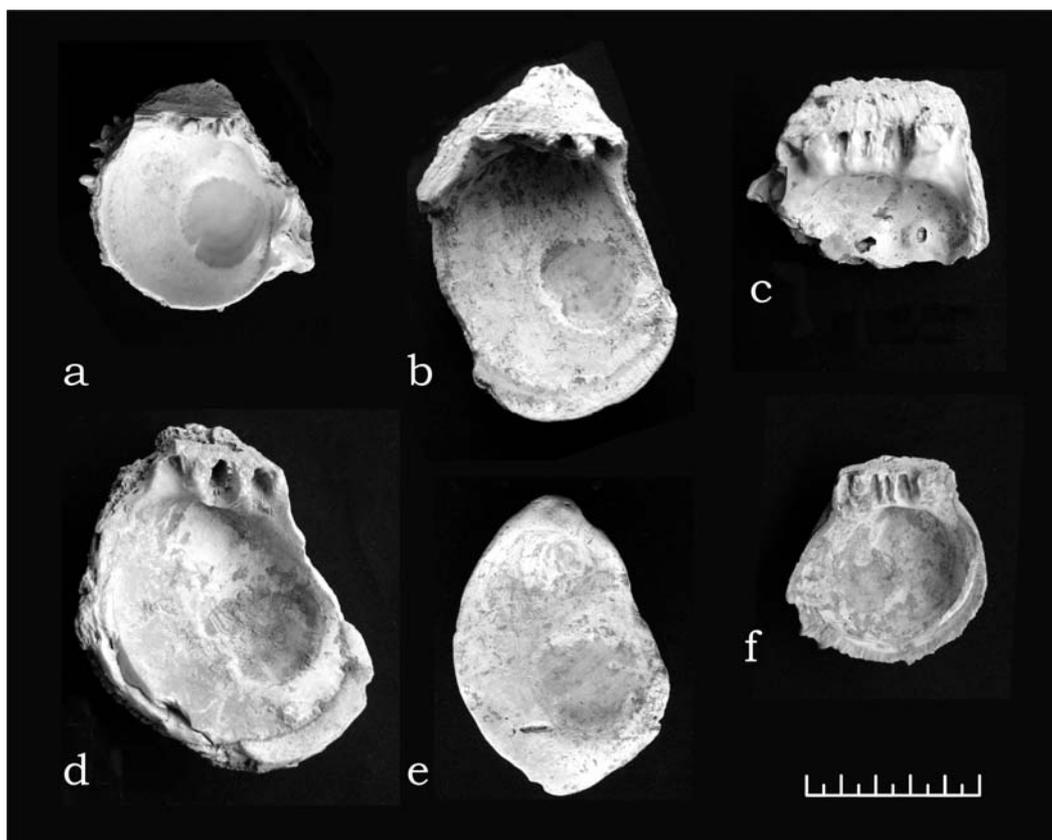


Figure 2. *Spondylus* shells found at Proskynas: a. chipped valve, b. cut and partially polished valve, c. cut hinge, d. cut and ground, e. beach-worn and partially polished, f. cut internal lip.

Cut marks have not resulted from depositional processes, since during excavation more sensitive and fragile shells were uncovered. Nor can they be attributed to the opening of the

firmly closed valves for extraction of the flesh (Prummel 2005:119), as most had been collected already dead. Additionally, the condition of shell breakage does not recall any of the stages of ornament manufacture suggested so far (Tsuneki 1988); none of the valves show any traces of working related to bracelets, beads or pendants; fragmented shells are only few and they do not seem to be wastes of production. Not a single ornament made of this shell was found.

Valves	Chipped	Cut and ground	Polished	Hinges
Left	39	34	13	15
Right	33	45	33	23
Total	72	79	46	38

Table 1. Proskynas: absolute numbers of *Spondylus* according to cut marks.

The above observations led us to conclude that *Spondylus* must have been used as a tool and especially as a scraping, grounding or percussion implement, probably representing an alternative toolkit to that of stone⁵. At this point, it must be underlined that at Proskynas grounded or polished stone tools are completely absent from the findings inventory. The preference of *Spondylus* instead of stone requires special investigation that goes beyond the aims of this paper. However, it is worth mentioning just a few obvious reasons.

Raw material is abundant in the area; in the Euboian Gulf, one of the most productive seas of the Aegean (Askew 1987), even at present one finds *Spondylus* both in the sea and during beach combing. The quality of material, hard and solid, closer to stone than to bone (Semenov 1964:76-78), makes it a perfect substitute for the former. The shape of a middle-sized *Spondylus* valve adapts perfectly in an adult's palm, especially if the outer surface is smoothed. Moreover, it can also form a complex tool, if it is fastened on a stick or a shaft on the cavity formed on both sides right before the hinge area (Safer Fearer & McLaughlin Gill 1982:30-34). The natural difference between right valves, which are stronger and heavier with a flat conjunction level, and left valves, which are lighter with sharp and serrated end lip, provides the opportunity for use in multiple tasks without any further labor.

Macroscopic and preliminary microscopic analyses allow us to suggest some possible uses of tools, even though experimentation with shell tools is rare and edge wear studies are

⁵ The *Spondylus* material from the Early Bronze Age site at Palamari, Skyros, has many resemblances to the Proskynas material (Manos & Parmala per. com.).

even rarer (Claassen 1998:203; Light 2005). Chipped and cut, as well as ground valves could have been used as scraping implements of rather hard surfaces; for example, for finishing vessels or for burnishing their outer surface (Kotsakis 1983:126; Rice 1987:137); for treating hides, for scraping and softening or cutting skins, where the blade needs to be moderately sharp otherwise it will cut the skin (Semenov 1964:85), for carving wood or as butchery knives (Toth & Woods 1989; Charpentier et al. 2004). Cut and ground heavy right valves might have been used for cracking and grinding raw materials, i.e. as percussion tools (Toth & Woods 1989:250-251) or during food processing, i.e. as mortars. Partially polished valves could have been used for polishing the surface of ceramics (Kotsakis 1983:128-129; Gibson & Woods 1990:42-43). Heavy usage of tools resulted in their destruction, as in some cases only the part near the hinge, which is thicker and probably also serving as the handle, is preserved.

As far as the spatial distribution of the material is concerned, more than half was (125) scattered around the settlement. The rest (110) was found in habitation contexts (Table 2). At the household level, *Spondylus* tools appear to have been subject of equal accumulation and used in various domestic activities. Data from the pottery analysis and distribution also show that every household was more or less equivalent in storing, producing and consuming food or acquiring "high status" vessels (Zachou, per. com.). The picture is rather different in the open areas, where *Spondylus* are fewer, even though one would expect to find more tools since an array of everyday activities must have taken place there.

It is worth mentioning that most of the *Spondylus* were in the same areas in each building with the "high status" vessels, either inside the buildings (Buildings A and C) or outside (Building D). Considering that apart from pottery all other findings are still under study, it is early to infer from this a situation of controlled accumulation or hoarding compatible to the "social storage" practice described by Halstead (1993), or to suggest a special status for these tools (Mahias 1993:174).

	Building A	Building C	Building D	Cistern A	Area B
Chipped	13	10	6	9	2
Cut and ground	6	7	9	8	1
Polished	5	8	5	2	1
Waste product	3	2	10	2	2
Total	27	27	30	20	6

Table 2. Proskynas: *Spondylus* tools distribution.

In brief, in the EH phase of Proskynas site *Spondylus* shells were collected intensively to serve as grounding and scraping implements and each household seem to have had access to an equivalent amount and range of equipment. The analysis of all other findings will provide better insights into household organization and hopefully into the reasons for choosing *Spondylus* to serve the above needs.

Middle and Late Bronze Age – The site of Mitrou

The settlement of Mitrou is a small tidal islet located in the Bay of Atalanti, almost 2.5 km west of Proskynas (van de Moortel & Zahou 2004). During the Bronze Age the sea level was several meters lower than at present and the site was probably not an islet but part of the mainland, situated on a low rise overlooking the shore. Habitation begins in EH period, if not earlier, while the most extensive remains brought to light date to the period from MH III (1750/1720-1680 BCE) until the Protogeometric era. Mitrou is an on-going excavation; nevertheless, four years of investigation have showed a different habitational pattern from Proskynas. The deposits constitute a tell site, since occupation areas are constructed directly over previous living surfaces. Remains from at least six buildings have been uncovered, which show a remarkable continuity in urban layout, with walls built in the same orientation and often on top of one another.

At present, almost half of the shell inventory, which comes from uncontaminated deposits, was studied. It consists of 6325 intact and fragmented shells of 46 species, mostly seashells. Taking into account the condition of the shells found, their spatial analysis and the archaeological comparanda, we can discern two major uses of shells: at least 62% represent food refuse, while 25% are the remains of small scale purple-dye production. The rest are of unknown use, possibly collected for aesthetic purposes, as curiosities, or brought accidentally to the site. Only few shells were modified for personal adornment; there are mainly pendants of *Cerastoderma glaucum*, *Luria lurida* and *Conus mediterraneus*.

The 12% of the shell assemblage is *Spondylus gaederopus*, with 749 specimens (Figure 3, Table 3). Of these, the 14% (68 valves and 40 fragments) is considerably worn and must have been collected as empty shells from the beach. The rest 86% (204 rights and 234 lefts valves) was gathered live. Applying the usual calculating method for Minimum Number of Individuals, at least 234 individuals were gathered; however, when we tried to join the right and left valves from three deposits with concentrations of *Spondylus*, none of the right

valves paired to the left, which means that the Minimum Number of Individuals is considerably higher (at least 339 individuals).

	NISp	Right	Left	Frag- ments	Beach- worn	Worked	Erosion
MH - LH IIIA1	371	135	129	107	43	102	2,2
LH IIIA2	99	20	35	44	11	20	2,3
LH IIIC	151	35	34	82	41	24	2,5
Protogeometric	128	14	36	78	19	22	2,4
Total	749	204	234	311	114	168	2,35

Table 3. Mirtrou: absolute numbers of *Spondylus* shells distributed vertically.

The valves come from adult specimens with medium to large size, i.e. 8 to 12 cm in length. Thus, *Spondylus* shells were fished from considerable depth and one-by-one by experienced divers, either with a sharp tool or by hitting them at the base with a rock for detaching the cemented shell (Gina-Whewell 1992:12). There are no noticeable differences in valve size among the deposits from the late MH to the Protogeometric strata. Hence, it seems that *Spondylus* exploitation did not affect the natural beds of the area, possibly due to careful and planned gathering strategies and perhaps a low level of exploitation.

The 78% of the *Spondylus* assemblage is intact or fragmented with no indication of further elaboration and treatment (Figure 4). The spatial distribution of the material indicates that the highest concentrations are connected with floors and occupational surface areas. The oldest deposit with a significant quantity of *Spondylus* dates to the late MH/LH I period (1600-1510/1500 BCE), where there is a sequence of floor make-ups with a considerable amount of pottery, animal bones, and food providing shells. Additionally, the excavation in a narrow corridor, dated to LH IIIA2 (1370-1310/1300 BCE) unearthed cooking and storage vessels in association with an articulated skeleton of a piglet, a high concentration of shells served as food, as well as many *Spondylus*. To the same period dates the third deposit that is worth mentioning with *Spondylus* and many food remnants; there, according to pottery analysis, we may have the remains of a probable feasting episode. Upon the above evidence, most of the *Spondylus* were found in contexts that evidence food activities. Therefore, we think it is reasonable to suggest that *Spondylus*, like other shellfish, was consumed as food. On the basis of the number of remains, it holds the third position among shellfish food, after *Cerastoderma glaucum* and *Cerithium vulgatum*.

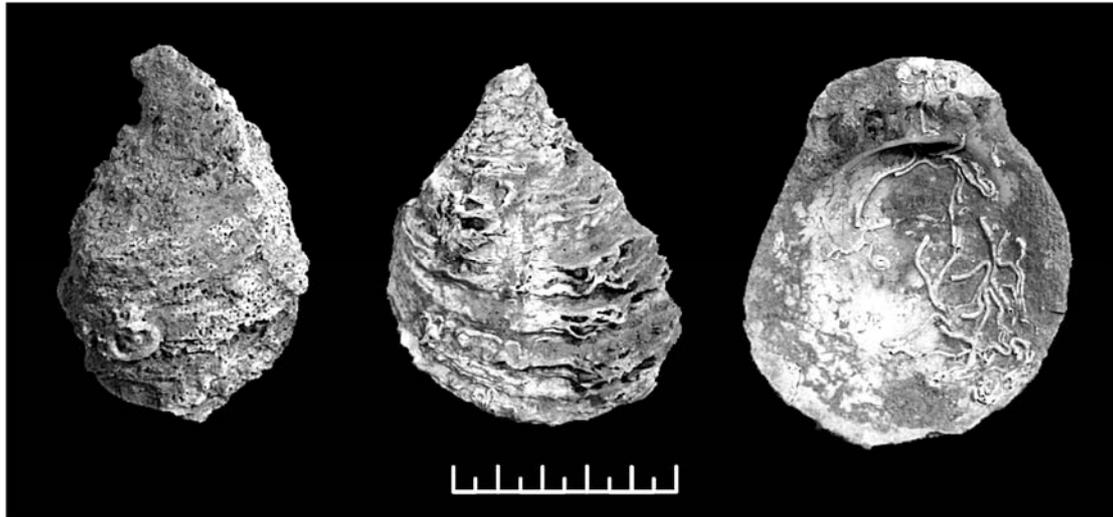


Figure 3. Mitrou: *Spondylus* shells.

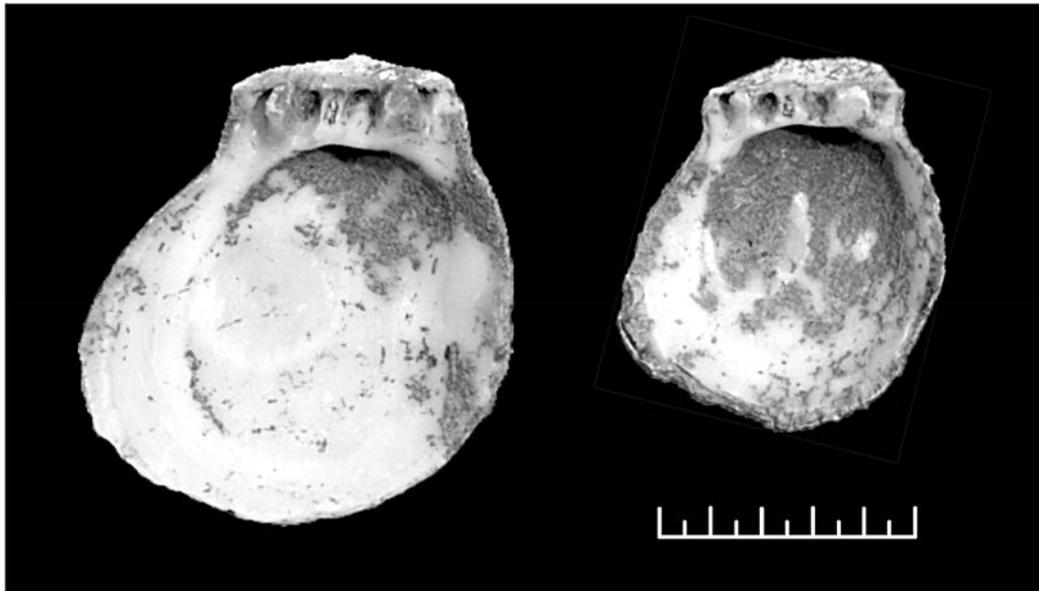


Figure 4. Mitrou: *Spondylus* food remnants.

Given that the excavation is in progress and the material is still under study, we cannot infer the intensity of exploitation and its role in the diet (Bailey 1975), (Waselkov 1987:117-139). Nor can we investigate matters of scheduling or division of labor related to shellfishing and/or food preparation and consumption (see for example Claassen 1991; 1997). However, the condition and contexts of finding are valuable for discerning possible cooking methods and consumption practices. Absence of cut marks, usually connected to the opening of the valves for the extraction of raw meat (Prummel 2005:119), from almost the half of the assemblage indicate the cooking methods. Hence, *Spondylus* flesh must have been consumed cooked; steamed, boiled or roasted (Goodale 1971; Meehan 1982; Prummel

2001). The finding of unpaired left and right valves, if not a matter of post-depositional processes, could distinguish food preparation and/or consumption from food refusal patterns. The preliminary analysis suggests that at Mitrou these practices were not taking place in the same area. The location of such activities is an object of research, as it could help to a better understanding of household organization. We hope that the completion of shell as well as animal bones analysis will provide sufficient data to answer such questions.

A sufficient amount of the material, the 54%, bears traces of secondary use. Like in the case of Proskynas, Mitrou dwellers must have used *Spondylus* shells as tools in everyday activities and discarded them after completing the desired task.

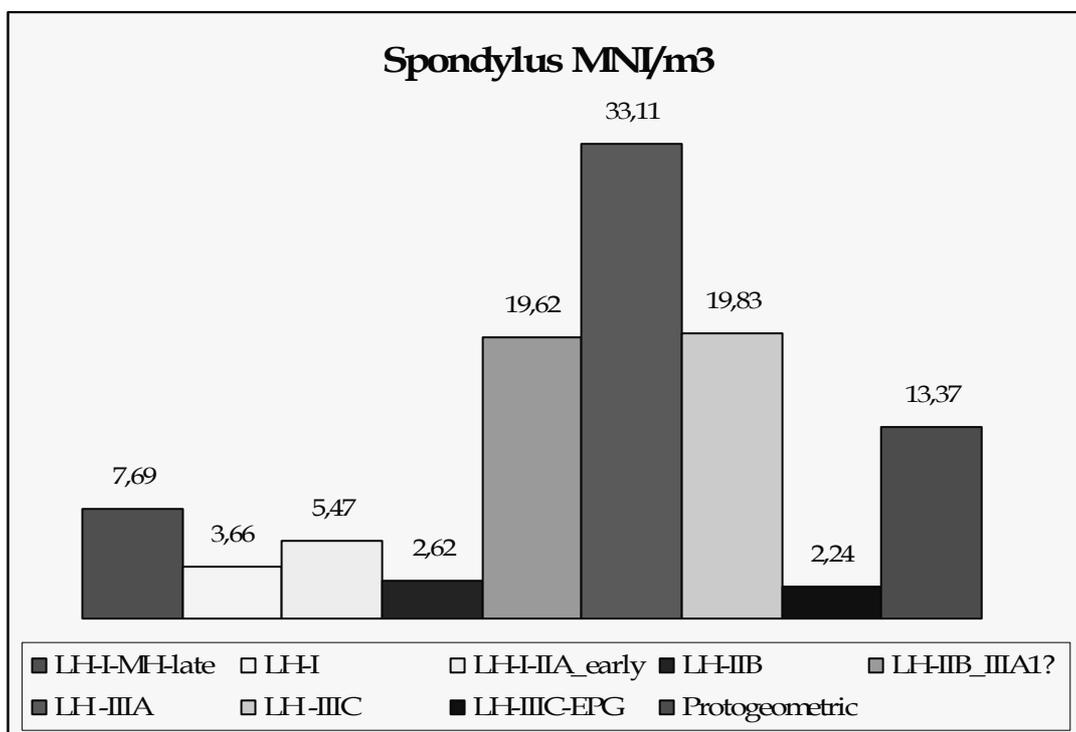


Figure 5. Mitrou: Graph showing *Spondylus* distribution according to density of MNI.

The vertical distribution of *Spondylus* is unequal; on the basis of the density of minimum number of individuals⁶ (Figure 5), *Spondylus* shells were mainly concentrated in the LH IIIA strata and it declines gradually as we move to the later periods. Another interesting concentration is found in Protogeometric strata, when there is a renewed interest in shellfish consumption. However, it is interesting to note that, regarding later strata, the focus shifts to the exploitation of purple-dye providing shells.

⁶ Minimum Number of Individuals per 1m³ of excavated soil.

In summary, at Mitrou *Spondylus* fishing and consumption primarily as food and secondarily as tool were common practices from the late MH period onwards. Whether a special value was attributed to it as food, as in the case of South America (Glowacki 2005; Paulsen 1974:605), or it was consumed in specific occasions cannot yet be detected. The completion of the excavation and study of all the material culture will shed more light to this matter.

Regarding other Middle and Late Bronze Age published shell assemblages, *Spondylus* flesh consumption seems to have been customary. The exceptional quantity found at Mitrou can be attributed to the geographical position of the site or local food customs. The decline detected in the latest LBA and earliest Early Iron Age strata could be explained on the grounds of changes in general economic and subsistence practices (Karali 1999: 16).

Concluding remarks

In summary, the present evidence from central Greece indicates that during the Bronze Age we are dealing with a continuous use of *Spondylus* geared to the satisfaction of settlement needs and household activities, whether they are related to tools or food consumption. The differences documented in the Aegean area regarding Neolithic ornament manufacture and Bronze Age everyday usage could be explained on multiple grounds, such as geographical position and trade networks, regional traditions and local practices.

For a general evaluation of the validity of these remarks and the perception of *Spondylus* both in the area and the era, we have to wait for the publication of other sites, for new archaeological investigations on the coastal sites of both northern and southern Greece, as well as for detailed and contextual analysis of *Spondylus* material from several Bronze Age sites. Additionally, experimentation with shell tools and wear analysis would provide the necessary data to determine how these tools were utilized.

The meanings of *Spondylus* ornaments, tools or food are unfortunately lost in the archaeological archive, but even though the uses of the shell shifted, its importance did not diminish with the passage of time. After all, it is widely accepted that tools and especially food play a decisive role in daily life, and their consumption can characterize or discriminate social groups, communities and cultures with equal, if not more, strength to ornaments (see for example Appadurai 1981; Bray 2003; Edmonds 1995; Farb & Armelagos 1980; Goody 1982; Scott 1996).

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