

# The necklace from the Strážnice site in the Hodonín district (Czech Republic). A contribution on the subject of *Spondylus* jewellery in the Neolithic

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**ABSTRACT** – The study refers to the issue of shell artefacts in the Early Neolithic and highlights the importance of identifying the correct genus and species of the raw material used. The subject of the study is an older find of a necklace, which had not been subjected to any analysis of species identification in the past. The shell material of the necklace was examined by ‘microstructural analysis’. This article also questions the age of the necklace and the possibilities of it having been reconstructed.

**IZVLEČEK** – Študija je usmerjena v artefakte iz školjčnih lupin v zgodnjem neolitiku in poudarja pomen prepoznavanja pravega roda in vrste uporabljenih naravnih materialov. Predmet te študije je ogrlica, starejša najdba, ki ji do sedaj še niso določili vrste uporabljene školjke. Lastnosti školjke sva prepoznala s pomočjo ‘mikrostrukturne analize’. V članku tudi podvomiva o starosti ogrlice in preučujeva načine njene rekonstrukcije.

**KEY WORDS** – *Spondylus*; Neolithic in the Czech Republic; shell artefacts; LBK; bivalves shell microstructure

## Introduction

People have always had a need for adornment; we know of decorations from Palaeolithic and Mesolithic graves. While in the Palaeolithic, pierced teeth and bones prevail, in the Mesolithic, shell artefacts made from snail shells occur in abundance (Grünberg 2000). The first evidence of the use of shell for jewellery production is from the Middle Paleolithic period (Arrizabalaga et al. 2011.11).

Neolithic necklaces can be made from three types of mollusc shell: *Spondylus*, *Glycymeris* or *Charonia* (Lampas) (Micheli 2010.24). Together with the advent of the Neolithic and Linear Pottery culture in our study area, a new species of mollusc, i.e. *Spondylus*, comes to the fore.

Species of the genus *Spondylus* live worldwide and, today approx. 65 species have been identified (Huber 2010.214). *Spondylus* shells are cemented to the

substrate in the same way as oysters. *Spondylus gaderopus*, which is the main source of raw material for Central European jewellery, lives in warm seas at depths from 2 to 30m as somewhat isolated individuals (Séfériades 2010.178). Their colours vary from violet to crimson or red-violet, and only exceptionally white. The lower part of the shell is white and the inner surface is reminiscent of white porcelain. This species can grow to a height of 15cm (Borello, Michelli 2005.71) and the lower (right) valve, with which the bivalve is attached to the substrate, can reach a thickness of up to 5.5cm, while the upper (left) valve is planar to slightly convex, with a thickness of up to approximately 2cm (Titschack et al. 2009.335).

The subject of this study is Neolithic jewellery found in the suburb of Strážnice in the South Moravian district of Hodonín town, which was previously de-

scribed by Jan Pavelčík as a necklace from the Moravian Painted Pottery culture (*Pavelčík 1955.50*). In 1959, Slawomil Vencl published a study of spondylid jewellery in Danubian Neolithic culture. The study contains *inter alia* an enumeration of sites where *Spondylus* jewellery had been found, although some doubts were expressed about the Strážnice necklace being made of this type of shells (*Vencl 1959.706*). The necklace was kept in a cabinet in a secondary school in Strážnice. Although a record of the circumstances of the find and accurate data on its location are not available, the author of the article does assert that it was found either in Strážnice or its immediate vicinity (*Pavelčík 1955.50*).

A number of questions emerge about this rediscovered find: (1) whether the genus identification (*Spondylus*) is correct; (2) whether we can agree with Pavelčík's dating to the period of Moravian Painted Pottery culture, and (3) what was its purpose?

An accurate identification of the bivalve genus from which the Strážnice necklace was made was essential for this article. Apart from the genus *Spondylus*, we could also consider *Glycymeris*, which was also found at Vinča, where it was falsely identified as *Spondylus* (*Dimitrijević, Tripković 2006.247; Siklosi, Csengery 2011.54*).

However, the greater occurrence of these bivalves is evident in the Carpathian Basin until late into the Lengyel or Tisza grave culture (*Siklosi, Csengery 2011.54*). As Maria A. Borrello rightly pointed out (*2005.28*), we have to take the *Glycymeris* shells into account in Central European Neolithic necropolises. At the same time, Borello (*2005.33*) names some other species that could have been used by prehistoric people in jewellery production<sup>1</sup>. In the past, not much attention has been paid to *Glycymeris* shells as opposed to *Spondylus*. The finds from the Levant have proved that it was no less important; this species was used there, for example, in highlighting the eyes of statuettes found at Ur (*Bar-Yosef 1991; Dimitrijević, Tripković 2006.238*).

Since all the beads were made from the same raw material, one cylinder<sup>2</sup> was examined by means of microstructural analysis by M. Golej. One large bead, off white to white colour, with a macroscopically visible slightly yellowish V-shaped area was selected for the microstructure analysis (Fig. 1.1). Yellowish

parts were present practically on almost all small and large beads, but predominantly on large beads, so the question was whether this macroscopically distinctive area was part of the original shell or recrystallized shell.

### Description of the large bead microstructure

The terminology used to describe the microstructure in this paper follows Benjamin P. Carter (in *Rhoads, Lutz 1980.79*) and Jay A. Schneider and Carter (*2001.609*). The large bead was first cut transversally. One half with a yellowish area was embedded in epoxy resin. When the resin hardened, the bead was cut again transversally and longitudinally (Fig. 1.1), then hand ground and polished on a glass plate to obtain a smooth, flat surface. Finally, the polished surface was etched for 40 seconds in 0.5% HCl, washed with tap water and dried; acetate peel replicas with acetate foil 0.2mm thick were then produced. The replicas were mounted between two glasses and studied under a light microscope. Three types of very well preserved microstructures were observed: (1) Dominates aragonitic crossed lamellar (CL) structure (Fig. 1.8) alternating with (2) complex crossed lamellar (CCL) aragonite (Fig. 1.4). The yellowish part is composed of (3) simple prismatic (SP) aragonite alternating with CCL aragonite (Fig. 1.7, 1.9). Small dark dots (originally pores) and tubes are present in all the observed layers (Fig. 1.8).

No recrystallisation was observed; hence, based on the preservation, we conclude that the shell is not a fossil and the macroscopically visible yellowish layer is not recrystallised shell or calcite, but an area with a composition different from the surrounding material. This SP layer is produced within the palial area and corresponds to the palial line and one muscle scar found in spondylids and the two muscle scars in glycymerids. No calcitic parts were found in any of the whole range of large and small beads available from the site at Strážnice; and all yellowish parts were assigned to SP aragonite. In contrast, Bernadett Bajnóczi *et al.* (*2013.880*) reported calcitic parts on three beads, but in Figure 4.f we do not agree with the statement that the irregular surface of the bead, not the sawtooth shape between the calcitic and aragonitic layers, indicates dissolution and recrystallisation. The shape of the contact of the outer calcitic and inner aragonite layers is not

<sup>1</sup> She names these shell raw materials: *Cypraea*, *Conus*, *Cardium*, *Dentalium* shell (*Borello 2005.33*).

<sup>2</sup> A bead marked with the letter 'C'.

sawtooth in the entire shell (for comparison see Fig. 2.3, 3.6) and the continuous run of the growth lines from the inner to the outer layer is natural, as is the shell's irregular surface. And finally, in Figure 4.f, below the opening, there are visible SP lines within the CL aragonite that can be present not far from the outer calcitic foliated (CF) shell layer, and the orange colour is the same as in Figure 4.e.

As documented in Figures 2.2, 3.6, 4.3, 4.6, the shell colour occurs only within the outer calcitic layer and is absent in the aragonitic middle and inner shell layers. Therefore, it can be stated that if coloured parts are present in Neolithic beads, this is the outer calcitic layer. In the material from the site at Strážnice, no coloured or calcitic parts were recognised, so we can conclude that all the beads were originally white and all CF layers had been removed as the beads were produced. The SP layer has become slightly yellowish after a few thousand years and is probably the result of deposition, accumulation or the incorporation of various minerals in low stable prismatic aragonite. This is much more visible in young tertiary fossils. Only one half of the bead surface was clearly weathered, with the regular growth lines being more visible compared to that on the smooth, polished and fresh surface. As can be seen in Figures 1.5 and 1.7 no recrystallisation from aragonite to more stable calcite is present, but only dissolution with the preserved, originally aragonitic, microstructure.

### Is the bead made of *Spondylus* shell? Comparison with other bivalve shells

Although the shell microstructure of species *Spondylus gaederopus* (Linnaeus, 1758) is known (Titschack et al. 2009; Maier, Titschack 2010) various thick-shelled bivalves can be considered as candidates for the production of large and thick beads. To answer this question, we studied the shell microstructure of two other species of this genus, especially *S. spinosus* (Schreibers 1793) (unknown locality) (Figs. 2.1–2.7, 3.1–3.7), *S. lamarcki* (Chenu, 1845) (Camotes Islands, Phillipines) (Fig. 4.1–6), then *Tridacna crocea* (Lamarck, 1819) (Palawan, Phillipines), a recent specimen of *Glycymeris (G.) glycymeris* (Linnaeus, 1758) from Brittany, France (Fig. 4.10, 4.11) and one fossil of *Glycymeris (G.) pilosa deshayesi* (Mayer, 1868) from Miocene-Badenian deposits in Slovakia (Borský Mikuláš town) (Fig. 4.7–4.9).

In the spondylids, we observed a uniform shell structure with variable shell thickness. Shells of the same

length of two different species may have different shell thickness. The outer shell layer of spondylids is composed of foliate calcite (CF), with relatively uniform thickness across species. The middle shell layer is composed of crossed lamellar (CL) aragonite, which can vary dramatically from one species to another. The last identified inner layer is composed of complex crossed lamellar (CCL) aragonite and simple prismatic (SP) aragonite that irregularly alternates near the center of the discus with the CL and CCL lines. The prismatic layer is visible as a dark line/lines that separate the CL and CCL layers (Figs. 2.3–2.4, 2.6; 3.1–3.3). This layer is thinner in sections perpendicular to the shell surface near the central axis (Fig. 2.4) and becomes thicker in various inclined sections and distances from the umbo (Fig. 3.2). The prismatic layer is produced by the mantle as a palial line and within the muscle scar (myostracum). The contact between the outer calcitic and middle aragonitic layer is sharp, or these two layers interfinger together (Figs. 2.7; 3.2, 3.5, 3.6; 4.5). Small dark pores and tubules are present in all the layers within the whole shell.

The glycymerid shells are composed entirely from aragonite, with an outer aragonitic CL layer, an inner layer of cone complex-crossed lamellar (cCCL) aragonite and an SP aragonitic layer (myostracum of muscle scars) (Fig. 4.7–4.9) as also described Tschudin (2001.659). The dark pores and tubes are present from the umbonal part to the ventral margin, but are absent on the ventral margin and in the teeth. In cross section, in comparison with spondylids, the structure of the glycymerids is completely different. The outer shell layer is irregular, 'ribbed' (Fig. 4.9). The last studied shell microstructure of tridacnids (giant clams) has been described by various authors (Schneider, Carter 2001.626; Aubert et al. 2009.991). The significant factor is of the absence of calcite and of pores and tubes. Based on our microstructural study of possible thick shelled bivalve candidates, we can conclude, that the Neolithic beads from Strážnice were produced from spondylid shells and the only one possible species in the vicinity of the appropriate thickness is *Spondylus gaederopus*.

Some earlier studies have already been devoted to the manufacture of similar beads. Here, I would like to mention Vladimír Podborský (2002a.237), Vladimír Ondruš (1975–76.136–137), Vencl (1959.734–735) or the recently-published study of Siklosi and Csengery (2011.50–51), where the authors deal inter alia with the quantity of *Spondylus* used for the

production of beads. According to this study, to create one large cylindrical bead, it would be necessary to use one shell, more precisely the right valve, which has the necessary thickness (Siklosi, Csengery 2011. 51). One shell bracelet manufacturing centre has been discovered in Italy (in the Liguria cave Arene Candide), where the researchers agree and indicate that a workshop for these bracelets was located on the shore, in front of the cave (Micheli 2010.30).

### Dating

It is known that during the period of the Moravian Painted Pottery culture in our region, spondylid jewellery is present only sporadically (see Podborský 2002a.224). Although this jewellery was worn, with various caveats, throughout the Neolithic and even later, the main period when this precious jewellery occurred (according to Henrieta Todorova) is from 5400/5300 to 4200<sup>3</sup> BC (Todorova 2000.415). In Central Europe, its greatest expansion was contemporary with the Linear Pottery culture (Nieszery 1995; Podborský et al. 2002b.236). Some years earlier, Slavomil Vencl (1959), who summarised the spondylid jewellery finds, made a similar observation. The finds of oval beads are chronologically classified into the Linear Pottery period (see Vencl 1959. 727).

In their study, Zsuzsanna Z. Siklosi and Piroška Csengery (2011) reconsider the use of Middle and Late Neolithic spondylid jewellery in the Carpathian Basin. Based on analyses of selected graves, they came to the conclusion that large, cylindrical, barrel-shaped beads, together with medium-sized, cylindrical, irregular- and barrel-shaped beads dominate the Middle Neolithic in this region<sup>4</sup>. By contrast, in the Late Neolithic small, flat, disc-shaped beads and thin bracelets are more characteristic (Siklosi, Csengery 2011.49–50).

Therefore we can state (with a certain amount of confidence) that the Strážnice necklace derives from the Linear Pottery culture in the Early Neolithic. This can be supported by the few traces<sup>5</sup> of the presence of Linear Pottery culture found in the vicinity of Strážnice town, particularly Hroznová Lhota village, at the location, 'U vodojemu' ('near water-tower'), where a few objects were retrieved from a Linear

Pottery settlement (Parma 2005.220). At the same site, at a location called 'Kozojídky', a collection of flint blades was salvaged and documented (Vaškových 2007.134). The Tasov village lays not far from Hroznová Lhota village, where Linear Pottery culture finds were recorded (Vaškových 2007.154). Furthermore, in nearby Tvarožná Lhota village and Vnorovy town, several random objects of Linear Pottery culture (especially pierced stone hoes) were discovered (Vaškových 2007.156, 161). In a residential area of Strážnice itself, cullet-blade material from the Linear Pottery culture was located (Vaškových 2007.152). The Mistrín site (district Hodonín) is the closest site to Strážnice where *Spondylus* jewellery has been found in a skeletal grave (Vencl 1959.703). Then, again in a child's burial remains from the Linear Pottery culture at Přerov-Předmostí (district Přerov) (Jarošová 1971.28).

### Reconstruction

The necklace contained 70 pieces of beads (Fig. 5), which can be divided into two categories: (1) long cylindrical (10 pieces, Tab. I), and small round pearl shapes (60 pieces, Tab. II). The long beads from Strážnice are 60–80mm long, with diameters from 13–15mm and hole sizes from 3–7mm. According to Vladimír Podborský (2002a.236) they belong to the category of 'large' beads. Small beads are 6–12mm long, with diameters ranging from 9–14mm and an almost identical hole size of about 3mm; therefore they belong to the 'small' beads category (Podborský 2002a.236). The whole necklace weighed 399g, of which the small bead weighed only 97g<sup>6</sup>.

We do not know the order in which the beads were originally assembled, nor if they formed one or more units: several bracelets, individual pendant beads or a combination of these possibilities have been proposed as alternatives to a single necklace. Nor can we exclude the form of a headband, especially in the case of small pearl-shaped beads. Because one side of the beads has a distinct weathered surface, we assume that this side was more exposed to meteorological effects. For this reason, we would suggest that the upper side could help us reconstruct the bead assembly correctly in the future (Figs. 6–8). Since the weathering stage and the state of preservation of all the beads are identical, we can as-

3 It corresponds with the dating of Linear Pottery culture.

4 The period, in which H. Todorova assumes the biggest expansion of *Spondylus* jewellery and in which the Linear Pottery culture appeared in our surrounding, is called the Middle Neolithic in the Carpathian basin.

5 Mostly there were found only a few pottery fragments.

6 For the weight of particular beads see Tab. I.



sume that the beads were found as one unit. This claim can be further supported by a microscopic, pedological analysis of the soil trapped in the crevices of the beads (Fig. 9), which proved to be the same type of sandy soil. Unfortunately, the lower part of the beads contains an adhesive compound, probably the result of the necklace being attached to a hard surface<sup>7</sup> (Fig. 10).

Most *Spondylus* artefacts originate from grave complexes. We can therefore assume that our beads most probably originate from one such grave complex. The idea for the reconstruction derives from the female grave at Cys-la-Commune, in which two types of material, *Spondylus* shells and limestone, were used. Also important, however, is the fact that long beads were mixed with small pearl shapes. The whole unit was placed on the upper part of the chest and in the area of the neck (Todorova 2000. 436, Fig. 21). Vencl makes a similar suggestion (1959. 728), stating in his synoptic paper that massive beads were usually strung as necklaces or headbands.

### Analogy

Although there are several tens of beads made of *Spondylus* shells in the Czech Republic, not all of them correspond in size. The greatest number of these beads originates in Moravia, where about 200 beads made from this raw material were found at a burial ground in Vedrovice village (Podborský 2002a.229). Large cylindrical beads (6.9–8.7cm long) were also discovered in Kadaň town, although more details about the find are unknown (Stocký 1926; Vencl 1959.701). Ten cylindrical beads came from a children's grave in Vejvanovice town, but these were only 1.6–5.3cm long (Vencl 1959.702; Zápotocká 1998.818). The beads from Vedrovice

bead	length (cm)	width (cm)	hole diameter (cm)	weight (g)
A	7.2	1.4	0.5	28
B	6.3	1.4	0.3	26
C	6.8	1.3	0.4	27
D	7	1.4	0.5	32
E	7.3	1.4	0.3	31
F	8	1.5	0.7	36
G	7.9	1.3	0.4	31
H	7.5	1.4	0.4	30
I	7	1.4	0.3	33
J	6	1.4	0.4	23

Tab. I. Proportions of long beads.

village were 0.8–5cm long, with a diameter of 0.6–2cm (Podborský 2002b. 223–240).

### Further discussion and new questions

According to the results of several published Linear Pottery culture burial grounds (e.g. Vedrovice, Podborský 2002a; 2002b; Nitra, Pavúk 1972 etc.) containing *Spondylus* jewels, we can assume that *Spondylus* beads were prestigious items and accorded social status (Pavúk 1972.73; Podborský 2002b.235; Sэфériades 2010.186; Lenneis 2007.133). While at the Nitra site *Spondylus* items dominate in anthropologically determined male graves, this is not entirely typical in the Linear Pottery culture in the territory of present-day Hungary. In the late Neolithic, the occurrence of *Spondylus* jewellery was exclusively limited to women and children (Siklosi, Csengerly 2011.56–57). Podborský (2002b.246) dealt with the issue of gender on the basis of the presence of *Spondylus* jewellery in the Vedrovice village graves. However, this was not systematically considered

bead	length (cm)	width (cm)	bead	length (cm)	width (cm)
1	1	1.2	31	1	1.1
2	0.7	1	32	0.7	1
3	0.9	1.1	33	0.7	1
4	0.9	1	34	0.8	1
5	0.7	1	35	0.8	1
6	0.6	1	36	1	1.3
7	0.7	1	37	0.8	1
8	0.8	1.1	38	0.9	1.2
9	0.8	1	39	1	1
10	0.7	1	40	0.9	1.2
11	1	0.9	41	0.9	1.1
12	0.8	0.9–1	42	1.1	1
13	0.7	1	43	0.7	1
14	0.7	1.1	44	0.8	1.1
15	0.7	1	45	0.8	1
16	0.8	1	46	0.8	1
17	0.9	1.1	47	0.9	0.9
18	0.8	1	48	0.9	0.9
19	0.8	1	49	1.2	1
20	0.9	1	50	1	1.2
21	0.7	1	51	1.1	1.1
22	0.9	1.1	52	0.9	0.9
23	0.8	1.1	53	1	1
24	0.9	1.1	54	0.9	1
25	1.1	1.2	55	0.9	1
26	0.8	1	56	1.2	1.3
27	0.8	1	57	0.9	1.4
28	0.7	1	58	1	1
29	0.8	1	59	1	1
30	1	1.2	60	0.9	1

Tab. II. Proportions of small beads.

<sup>7</sup> It is probably due to exposure in the past.

or investigated over a wider area and any answer would undoubtedly be influenced by the poor preservation of the Neolithic skeletal remains. Why was this jewellery popular, and can we reconstruct its significance?

### Popularity of *Spondylus* jewellery

According to several studies (see *Podborský 2002b. 236*), the white colour of this shell was the most popular among people in the Neolithic. Yet, this should be reconsidered. If the decoration had been made from contemporaneous Neolithic specimens, the bead would not necessarily have been white since the colours of recent *Spondylus* shells vary from crimson to yellow-orange. This fact has already been mentioned by Séfériades (*2010.186*).

More than 20 years ago, scientists were already occupied with the question of contemporaneous and fossil utilisation. At that time, they absolutely excluded the utilisation of fossil shells (*Shackleton, Elderfield 1990*). The opposite was proven at Cernica in Romania, where fossil mollusc shells were used (by *Comşa 1973.72*). The *Spondylus* artefacts found in the burial ground in Vedrovice village analysed by Šárka Hladilová unambiguously proved the utilisation of recent material (*Hladilová 2002. 257, 263*). The recent return to this issue (e.g., *Dimitrijević, Tripković 2006*) demonstrates that no definitive answer has yet been established and it will be necessary to approach the issue within individual regions.

The necklace from the Strážnice site was made from recent shells. It even seems that only the aragonite part of the shell was used deliberately in its production, probably because of its white colour.

In the case of production of long cylindrical beads, the shell must have been hard and long, and therefore larger pieces of jewelry or beads could have been more valuable and highlight the status of the wearer/person.

### Summary

In this article, it has been established that one of the most important issues regarding Neolithic shell jewellery is the accurate identification of genus and species. For those living in the Neolithic, several possible raw materials could have been used to make jewellery. Our attention cannot be focused only on new finds; we have to make a revision of past finds,

even at the risk of damaging parts of the samples in the analysis.

Apart from identification, it is necessary to know whether our artefact was made from a recent or a fossil shell. For recent examples, it is then especially appropriate to make further analyses (particularly isotopic analysis and, alternatively, analyses for shell age identification).

To summarise the results of this brief study, we discovered that the necklace from Strážnice site was made from recent shells of very large *Spondylus* individuals and was white (all the coloured calcitic shell layers were removed in production). It was erroneously classified to Moravian Painted Pottery culture. The necklace most probably belongs to the Linear Pottery culture, and judging from the weathering of individual beads and pedological analysis, the necklace is a single item. Based on an analogy from graves discovered earlier, we can try to reconstruct the form of the beads. One of the most probable possibilities is that the beads were placed on the upper part of the torso and neck and, therefore, it could be a necklace. Further analyses of the above-mentioned beads could help us to answer the questions of shell age and its place of origin.

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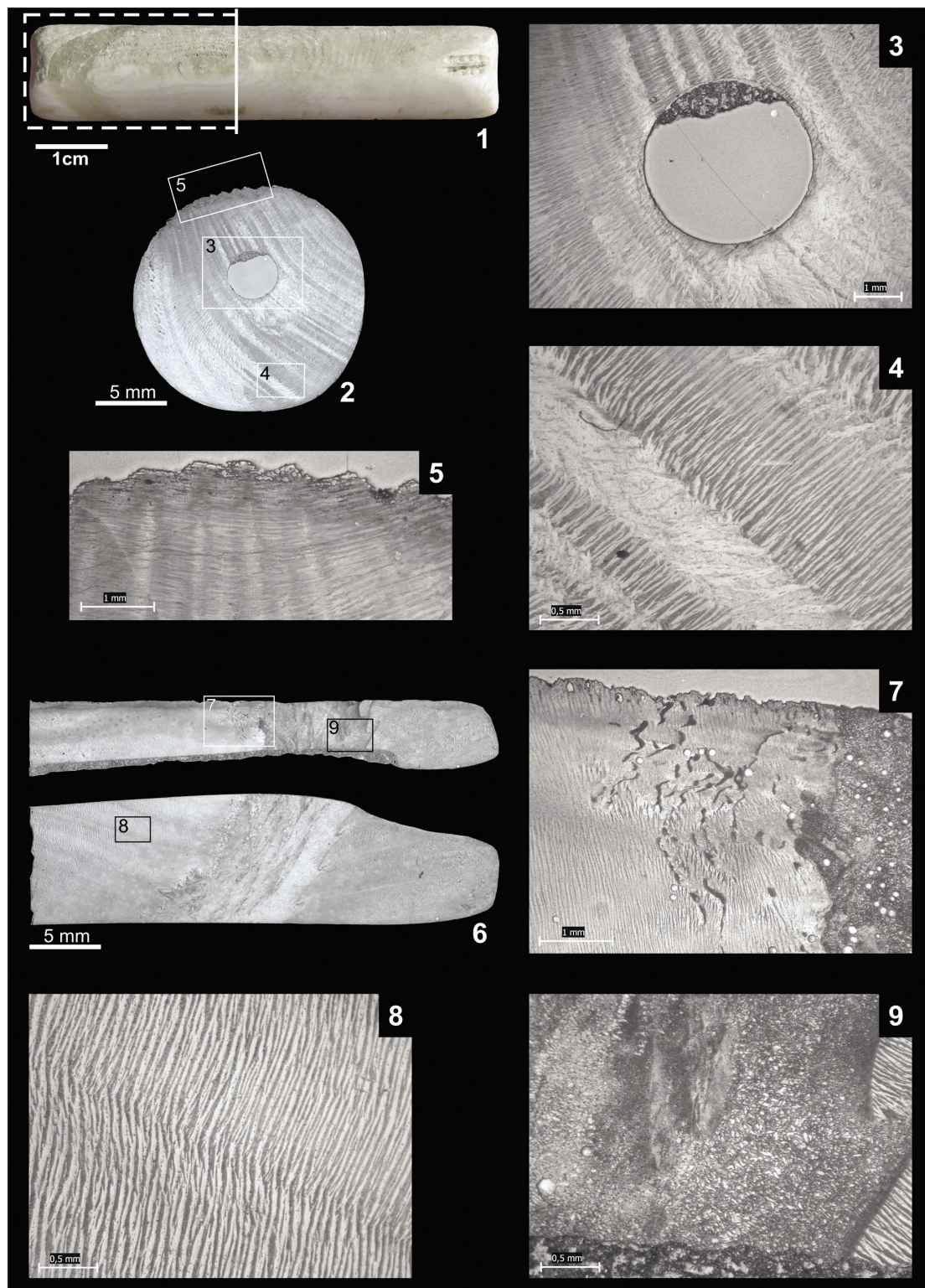
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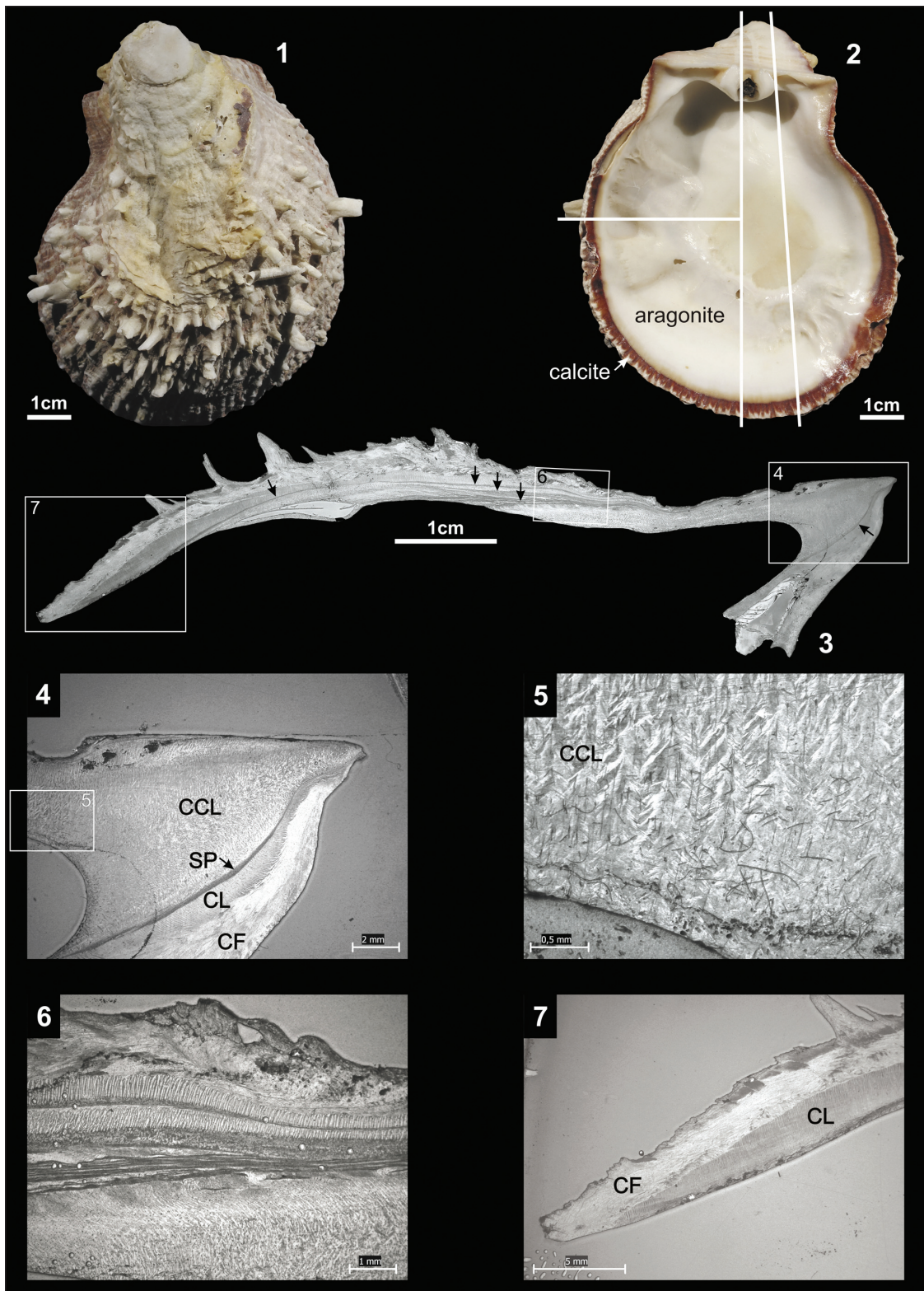
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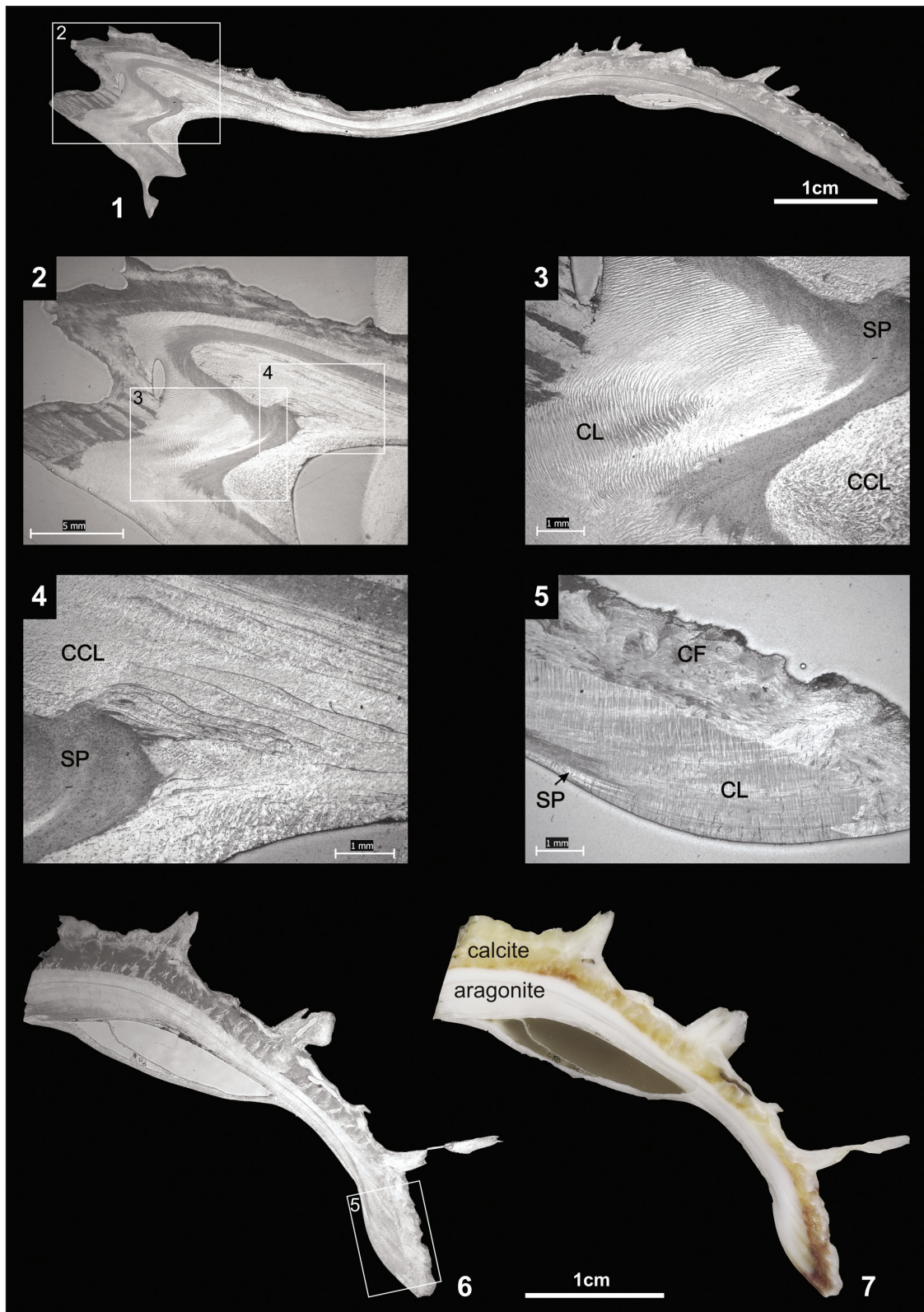
**Fig. 1.** The Neolithic bead from the Strážnice site, Moravia, Czech Republic. 1 Marking of the longitudinal and transversal sections through the bead with yellowish V-shaped part. 2 Transversal section through the bead with distinct growth lines. 3 Detail of Fig. 1.2. Sandy soil from the original site is trapped in the bored hole. 4 Alternating CL and CCL aragonitic layers. 5 Detail of the weathered surfaces of the bead. The dissolution of aragonite is visible, but no recrystallisation. 6 Longitudinal section through part of the bead and the yellowish part. 7 Contact of the SP and CL layers. The dark irregular lines are also composed of SP aragonite. The weathered, irregular surface, with traces of dissolution. 8 Very well preserved CL aragonite. The dark pores (dots) are visible. 9 Detail of the yellowish part composed of SP and CCL layers. (2–9 Acetate peels).



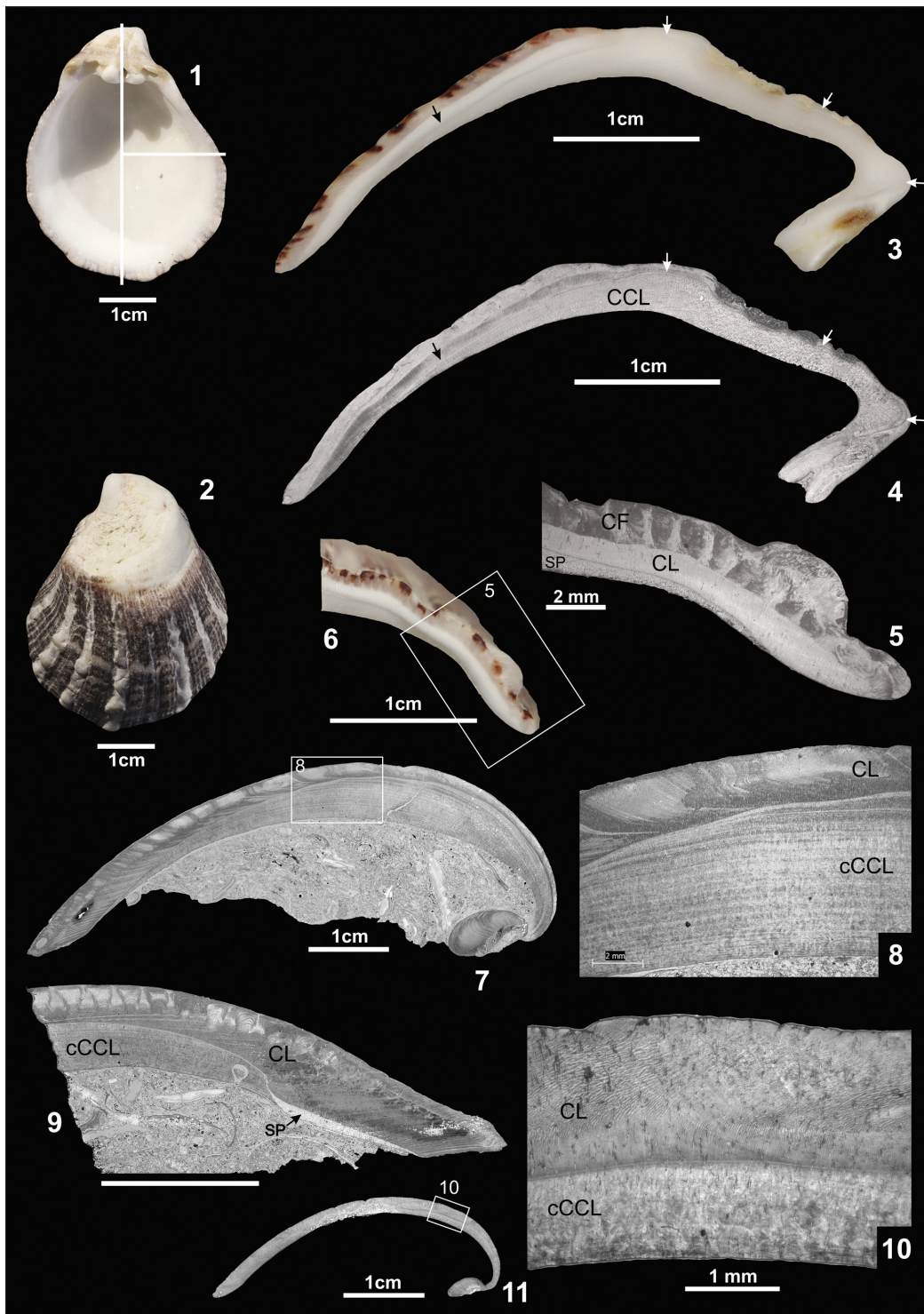


**Fig. 2.** *Spondylus spinosus* Schreibers, 1793 (unknown locality). Right valve. Recent. 1 Exterior of the right valve with visible attaching area in the center of the discus. 2 Interior of the valve. One transversal and two longitudinal sections and parts composed of calcite and aragonite are marked. 3 Axial longitudinal section. Arrows indicate the dark SP lines which separate the CL and CCL layers. 4 Detail of the umbonal region showing all layers of the spondylid shell. 5 Detail of the CCL microstructure. 6 Part of the shell near the centre of the discus with alternating CL, SP and CCL layers. 7 Detail of the ventral margin of the shell. Note the interfingering of the CF and CL layers and that the colour bearing calcitic layer is the outermost shell layer. (3-7 Actetate peels).





**Fig. 3.** *Spondylus spinosus* Schreibers, 1793 (unknown locality). Right valve. Recent. 1-4. Longitudinal, slightly inclined section distant from the central axis. 2 Detail of the umbonal part. The dark line is composed of SP aragonite. Its thickness is greater compared with that in Fig. 2.4 because of not perpendicular section to the shell surface. 3 The SP layer occurs between the CL and CCL aragonitic layers. 4 Irregular interfingering of the SP and CCL layers similar as in the Neolithic bead in Fig. 1.7. 5 Transversal section through the shell near the anterior margin. 6-7 Transversal section. Comparison of the acetate peel (5) and shell section, with colour present in the calcitic layer (7). (1-6 Acetate peels).



**Fig. 4.1–6.** *Spondylus lamarcki* Chenu, 1845 (Camotes Islands, Phillipines). Right valve. Recent. 1 Interior view with marked sections. 2 Exterior of the shell, attaching area is white. 3–4 Axial longitudinal section. Arrows indicate the SP layer (3) View of the shell. (4) Acetate peel. 6 Transversal section with detail (5) of the posterior shell margin (acetate peel). The colour is present only in the calcitic outer shell layer. 7–9 *Glycymeris* (G.) *pilosa deshayesi* (Mayer, 1868). Tertiary – Miocene, Badenian. Slovakia (Borský Mikuláš town). Acetate peels. 7 Longitudinal section. 8 Detail of the shell microstructure. The outer shell layer is composed of CL aragonite, while the inner is composed of cCCL aragonite. Small dots are originally pores and tubes. 9 Transversal section. The SP aragonitic layer within the muscle scar (myostracum) is visible. 10–11 *Glycymeris* (G.) *glycymeris* (Linnaeus, 1758) from Brittany, France. Recent. Acetate peels. 11 Longitudinal section. 10 Detail of clearly visible outer CL layer and inner cCCL layer. Pores and tubes are visible.





*Fig. 5. A view of the complete necklace (possible appearance).*



*Fig. 6. Detail of weathering on small beads.*



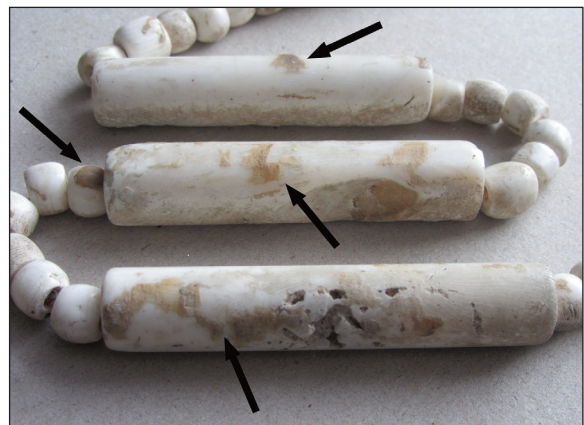
*Fig. 7. Detail of the back on the example of selected beads.*



*Fig. 8. Detail of the top of the weathering on the example of selected beads.*



*Fig. 9. Detailed view of the slot (as shown by the arrow) in beads E and D which was collected from a soil sample.*



*Fig. 10. Arrows illustrate the material glued on beads.*