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Lana Marina, id est Sea Silk

Among the textiles of antiquity, there are fabrics and clothing materials that are almost only described in literature, with the help of which conclusions can be drawn about the textiles used in antiquity. Yet, in the case of these clothing materials, even the exact identification often encounters obstacles due to the different names used for the textiles and the insufficiency of the surviving archaeological evidence. In my study, I intend to describe lana marina, that is, sea silk, one of the materials considered very rare and expensive in antiquity. My goal is to summarise its characteristics, the method of making sea silk, its history, and the problems surrounding its name, and also to describe its Hungarian aspects, as well as the Sea silk project, founded in 1998 with the intent of searching and preserving knowledge about sea silk and its production.

Keywords: silk, seashell, linguistics, textile, *byssus*, *De medicamentis ex animalibus libri*

Since they were made of organic materials, very few of the textiles of antiquity have survived: at most, small pieces of fabric, from which we can draw conclusions about the techniques used in antiquity. However, there are also fabrics and cloths that are almost only entirely described in literature. In the cases of these textiles, even the precise identification of these textiles is often hampered by the different names used for the materials, the scarcity of archaeological evidence, and the long time horizons of many centuries. In the following article, I would like to summarise the characteristics, preparation method, history, problems surrounding the naming and the Hungarian aspects of a material that

was considered very rare and expensive in antiquity: sea silk. At the end of the article, I would like to briefly describe the Sea Silk Project, which was founded to research and preserve sea silk production and the knowledge surrounding this material. In this article I also evaluate the references to sea silk from Sextus Placitus, whose work is one of the ancient sources on the material.

What is *lana marina*?

Sea silk is one of the mysterious textiles of antiquity, referred to as *'lana marina'* in the literature of the time. In antiquity it was also known as sea wool, made from the so-called bisque yarn of the *Pinna nobilis*, the large ham shell. The mussel itself is native to the Mediterranean, found in shallow waters up to 40 metres deep, and prefers clean water and sunny places. The mussel lives embedded in the seabed, using clinging threads called byssus filaments, and grows to 10-15 centimetres in the first year of its life but can grow up to 120 centimetres and live for over 50 years.[1] The mussels were fished in large quantities, not only for their byssus fibres, which are important for this study, but also for food, and as with all large marine molluscs, they were also hunted for pearls. Due to overfishing, the mussel is now a protected species.[2]

The making of *lana marina* from the bisque yarns of the mussel is a long and meticulous process. Today, very few people make this special yarn in an artisanal way, handing down the techniques through generations. Their experience gives us an idea of how this material was made in ancient times. Obviously, the process in antiquity must have looked quite similar to the techniques used today. The bisque yarns extracted from the sea are first washed in seawater to remove as much debris

[1] Muschelseide: Biology.
[2] McKinley (1998: 34–35).

as possible. They are then rinsed with clean water, and any remaining impurities are removed by hand. This is followed by another wash, and finally the yarn is dried between two cloths in a place protected from the sun. After drying, any remaining slack is removed, and then the fibres are thoroughly combed and spun into yarn.[3]

Depending on its origin, the finished product is a lightweight, heat-retaining fabric that is bronze, copper, golden yellow, brown, olive green or even black in colour and closely resembles silk. Perhaps due to the wide range of natural colours occurring, the available sources do not mention the dyeing of *lana marina* garments.[4] As for its most common colour, gold: for a long time, some researchers thought that the golden fleece, well known from Argonautica, could be identified as *lana marina*, but this assumption was soon abandoned.[5]

Byssus, but not *byssus*

One of the biggest problems in researching the history of sea silk is the scientific name of the silk itself. The zoological name for the material used to make it, the so-called 'fibre beard' of the mussel, is the Latin word *'byssus'*, meaning fine linen or cotton cloth.[6] This Latin word for the material comes from the ancient Greek feminine second-accent word 'βύσσος', which has a similar but more general meaning.[7] It is worth noting here that in ancient Greek, the masculine word 'βυσσός', which has its accent at the end and means 'the depths' and 'the bottom of the sea',[8] makes the word a simple but deceptive homonym. This also may have been the

[3] Muschelseide: Handicraft.
[4] Muschelseide: Handicraft.
[5] McKinley (1998: 26–29).
[6] Finály and Georges (1869: 652) and Lewis–Short (1879, 256).
[7] Györkösi–Kapitányffy–Tegyey (1993: 195) and Liddell–Scott (1901: 296).
[8] Györkösi–Kapitányffy–Tegyey (1993: 195) and Liddell–Scott (1901: 296).

basis for the later identification of the mussel with the word *'byssus'* by zoologists. Chinese literature aptly refers to the animal from which this particular silk is made as a water sheep or sea lamb (*shuiyang*).[9]

As for the Latin rendering of the Old Greek feminine, the second-accented 'βύσσος' word as *'byssus'*, the original Greek term goes back to the Hebrew word *Būṣ*, which also means 'fine cloth' and occurs in several places in the Old Testament. This fact is used in literature to prove that sea silk is mentioned in the Bible. However, the etymological link alone hardly proves that the Hebrew word also originally meant sea silk, so the theory that sea silk appears in the Bible is an a posteriori conclusion which cannot be taken for granted in the absence of further data.[10] The terms *'byssus'* and 'sea silk' have then become almost completely confused over time. By the time it enters modern scientific literature, such as English, German, French and Italian encyclopaedias, *'byssus'* is either taken to mean simply 'sea silk' or is used as a synonym for it.[11]

Going back to antiquity, this precious material is mentioned only twice in the texts of the time as *lana marina*: once by Marcellus in his *De medicamentis*[12] and once by Placitus in his *De medicamentis ex animalibus libri*,[13] which is based on the subject of medicine. The *Pinna Nobilis*, or *Pinna*, as it was called, a species of shellfish that produced the raw material for sea silk, was known even to the ancient Greeks. The most detailed description of it is found in Aristotle's *Historia Animalia*,[14] but the silk is only mentioned in Greek Letter literature once, just in passing.[15]

[9] Székely (2013: 164).
[10] Muschelseide: Linguistics. For more information on the appearance of *byssus* in the Bible, see the linguistic aspects section of the *Sea silk project* website.
[11] Muschelseide: Linguistics. The encyclopaedia articles concerned can be found in the linguistic aspects section of the *Sea silk project* website.
[12] Niedermann (1968: 185, VIIII. 73).
[13] Brasavola (1538: 8).
[14] McKinley (1998: 22–24) and Wentworth (IV, 4, 528a, 20–528b; V, 15, 547b, 15sqq.–548a, 6sqq.; VIII, 1, 588a, 14–15sqq.).
[15] Wright (1928: 41).

Of course, using Aristotle's data, Pliny's *Naturalis Historia* also gives us a description of *Pinna*, but in his extensive encyclopaedia, he also does not mention sea silk either. This source will be discussed in more detail below. From the imperial period we find indirect references to sea silk in Tertullian and in the imperial price lists of Diocletian, and also probably the *'pinnika'* mentioned by Periplus in the *Maris Erythraei* is a reference to sea silk.[16]

Lana marina in ancient times

Just as the term *'byssus'* is nowadays very difficult to distinguish from sea silk, the history of *Pinna Nobilis* and *lana marina* is also inseparable. As mentioned above, although Aristotle does not comment on the silk itself, he does give a detailed account of the mussel. He describes its habitat and appearance and even mentions that a species of shrimp coexists with the *Pinna*,[17] although the relevant data in ancient comic literature cast doubt on whether this coexistence is symbiotic. In any case, this shellfish was so important to the Greeks that it even appears on their coins.[18] As for the other important Greek source mentioned, the letter of Galen in Greek, there is no detailed description of the silk, understandably, since the writer merely informs his addressee that, in addition to the purchase of sea sponges, they are also asked to purchase *lana marina*.[19]

In Roman times, Pliny gave a detailed description of *Pinna*, closely following Aristotle's work, but makes no mention of sea silk, which is surprising given the *Naturalis Historia*'s many descriptions of textiles and plant materials. Instead, following his Greek source, Pliny also focuses his description on the relationship between *Pinna* and the

[16] Székely (2013: 163–164) and W. Salgó (2010: 49; 59).
[17] McKinley (1998: 22–23).
[18] McKinley (1998: 30–34).
[19] Alciphron (1928: 41).

shrimps.[20] This relationship is mentioned by several authors, including Nicander, Apicius,[21] and in two of Cicero's works: the *De finibus bonorum et malorum* and the *De natura deorum*, where he cites this symbiosis as a moral example.[22]

In relation to the appearance of *Pinna* and *lana marina* in Roman literature, it is interesting to note that while we have descriptions of *Pinna* from both oratory and scholarly works, *lana marina* is only mentioned in two medical works by Marcellus and Placitus. In both of these works, sea silk is recommended for the application of a substance for healing. Both works focus on medicine and therefore do not define *lana marina* itself. From the lack of definitions, two conclusions can be drawn, but neither can be clarified in the absence of further data. Therefore, either one or the other hypothesis is acceptable. The first conclusion is that the use of *lana marina* was widespread and therefore part of the general knowledge of the late ancient Romans, and that is why it did not need further definition. The second conclusion is the opposite of the first one, namely that the supposed users knew exactly what it was due to its rarity and special nature. In this case, too, there was no need to specify what the substance was either.

The sea silk of Aquincum

The earliest specimen of sea silk[23] is from Aquincum, the present excavation area of the Szemlőhegy, found on 12 August 1912.[24] Two burial sites were found in the Roman cemetery here, one of which had already been excavated at the time of discovery, while in the other, a female

[20] McKinley (1998: 34–35).
[21] McKinley (1998: 34).
[22] McKinley (1998: 31).
[23] Maeder (2008: 113).
[24] Székely (2013: 163).

mummy was discovered by archaeologists.[25] Thanks to the coins placed next to the mummy, the date of the closure of the tomb was estimated to be between 326 AD and the 5th century AD.[26] The discovery was made by Ferenc Hollendonner, who also inventoried the objects found in the tombs[27] and found that sea silk, which he described as a brownish,[28] coarse, brittle, easily breakable material most resembling human hair, was incorporated between the wrapping of the female mummy.[29]

Unfortunately, the excavation diary and the original analysis disappeared during the Second World War, and the only information we have on the mummy and the excavation is Hollendonner's work; therefore, further investigation of the claims is impossible. However, his publications and his professional knowledge make it likely that his identification of the unknown material found on the mummy as sea silk was correct. Hollendonner, in his short, two-page report published in 1917, says that after microscopic examination of the cloth found in the grave, he was convinced that the unknown material could not be of vegetable origin or animal hair and that it must therefore be a silk-like material of some other origin.[30] He further explains that there are striking differences between silk made from the secretions of silkworms and silk made from the byssus yarn of *Pinna Nobilis*.[31] The analysis demonstrates that Hollendonner must have been familiar with the literature on the biological and chemical structure of the sea silk; hence, the identification of the material can be reliable.[32]

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[25] Székely (2013: 163).
[26] Maeder (2017: 114) More detailed information on the coins used for dating can be found in Póczy (1998).
[27] Székely (2013: 163).
[28] Székely (2013: 163).
[29] Maeder (2017: 113) and Szilágyi (1939: 5).
[30] Hollendonner (1917: 36–37).
[31] Hollendonner (1917: 37).
[32] Maeder (2008: 113).

In contrast to traditional silk, the fibres of sea silk are twisted, ending in a point, and have a cross-section resembling a flattened ellipse.[33] However, in Hollendonner's opinion, the easiest way to distinguish between the two materials is to use polarised light: while sea silk only refracts light once, so the field of vision remains dark during the experiment, real silk refracts light twice, resulting in threads of different bright colours in the field of vision. In the case of the Aquincum finds, the field of view remained dark, as is typical of sea silk, and was chemically identical to the samples taken from *Pinna Nobilis*.[34]

It should also be noted that the researcher, thanks to his botanical training, was aware of the difference between the terms used for zoological byssus and ancient sea silk.[35] This is demonstrated by the fact that he himself found it important to point out in his account that the term *'byssus'*, which is commonly used, including in the Bible, does not refer to sea silk but to the fineness of the cloth used.[36]

The sea silk from the Middle Ages to the 20th century

For a long time in the Middle Ages, sea silk was thought to have been used to make clerical vestments. However, this claim proved to be false in light of later research on papal vestments, which were made of silk mixed with linen and gold threads and not of sea silk. The misunderstanding may have been caused by the fact that both *lana marina* and clothes made from the feathers of native birds were referred to as 'material that changes colour in the light' and may also have been contributed to by the 9th-century letter in which we find the first reference to the production of sea silk in Sardinia. Evidence that sea silk was already

[33] Hollendonner (1917: 37).
[34] Hollendonner (1917: 37).
[35] Maeder (2017: 113).
[36] Hollendonner (1917: 36).

a special treasure in the Middle Ages is provided by a letter written by Bertha, daughter of Lothair II, around 906 AD, in which she asks for the friendship of the Baghdad Caliph and mentions twenty hoods made of sea silk as a way of demonstrating her wealth.[37]

Mediaeval Jewish sources also mention *lana marina* as 'wool growing in the sea' or 'the wonder of the Western world'. There are also references to the sea silk in poems from 13th-century Italy and 14th-century Byzantium. Also, from this century comes the oldest surviving piece of *lana marina* clothing in the world, a knitted cap. The survival of this find, like that of many other ancient textiles made of sea silk, was ensured by the fact that it belonged to a private collection, but its age could similarly only be determined from the age of the other pieces in the collection. It was associated with Renaissance Florence, which was a centre of trade in expensive fabrics, and several records refer to *lana marina* as 'fish wool'.[38]

During the 15th and 16th centuries, sea silk was more of a curiosity; *Pinna Nobilis* was usually mentioned in the travel diaries of explorers, travellers and young people on their so-called grand tour, and also collectors of *lana marina* objects. It was also around this time that the first books on natural history were published, which already mentioned the great ham shells and sea silk. Following the Age of Discovery, the 18th century saw a renewed interest in *lana marina*; more natural history research on the shellfish was carried out, and attempts were made to revive the production of sea silk in France and Germany, but unfortunately without success. It is therefore interesting that most of our surviving material comes from this period. In the 19th century, sea silk garments were exhibited at several world fairs in Europe and America. At the same time, the production of *lana marina* was flourishing again

[37] Muschelseide: History, Middle-Ages.
[38] Muschelseide: History, Middle-Ages.

in Sardinia and in Apulia, now known as Puglia, but the Second World War quickly put an end to this development.[39] Between 1950 and 2000, sea silk was barely mentioned in academic works until 1998, when Daniel McKinley's *Pinna and her silken beard: a foray into historical misappropriations*, still considered a seminal work on *lana marina*, was published.[40]

Sea silk project

The Sea silk project was founded by Felicitas Maeder from Switzerland. She came up with the idea for the project in the summer of 1997, when she and her colleagues at the Natural History Museum in Basel were trying to create an exhibition of shells and snails for all generations to enjoy. One of the suggestions that came up during the preparations was sea silk, which immediately caught Maeder's attention. As a researcher, she immediately set about gathering sources, but her doubts remained after reading both the biology and the textiles literature, due to their contradictory wording.[41]

During the course of her further research, she even began to question the very existence of sea silk. The first problem was to find a term to name the objects in her possession, a task aided by her pre-existing interest in linguistics. By the winter of 1997–98, she had found evidence of *lana marina* when she was able to exhibit one glove from the Zoological Collection of the University of Rostock in the Natural History Museum in Basel, as well as a piece of sea silk and weaving tools from the Museum der Kulturen in Basel. In 1998, the Sea Silk Project began to take shape with three declared aims: 1) to inventory all objects that can be found today, 2) to explore the history of the material and the craft of

[39] Muschelseide: History, modern Times. More information about the events I mentioned can be found on the Sea silk project website.
[40] Muschelseide: History, Sea-silk in the new millennium (2000-2020).
[41] Muschelseide: Sea silk project.

making sea silk, and 3) to document the techniques still available of a dying craft.[42]

In 2000, together with Marcel Halbeisen of the Swiss Federal Laboratories for Materials Testing and Research (Eidgenössische Materialprüfungs- und Forschungsanstalt, EMPA), they were able to develop an analytical method to identify sea silk. In the same year, together with Elisabeth Wiederkehr, she came up with the idea of a sea silk exhibition, which in 2004 became the world's first exhibition on the theme of sea silk, titled *Muschelseide – Goldene vom Fäden vom Meeresgrund* / *Bisso Marino – fili d'oro dal fondo del mare*, in collaboration with the Museum of Natural History and Culture in Basel.[43]

In 2013, the Department of Cultural Heritage of the University of Salento, in partnership with the Centre for Textile Research of the University of Copenhagen, organised the first conference on sea silk, *Treasures of the Sea – Sea silk and purple dye in Antiquity*. This conference was the first time that Assuntina and Giuseppina Pes from Sant'Antioco demonstrated the process of making sea silk.[44]

Thanks to the possibilities of the internet, the Sea silk project has collected a wealth of previously inaccessible sources from the 16th to the 19th century in many languages from different countries. Thanks to modern search engines, it is now easier than ever to find the information you need. That is what made it possible for the Sea silk project to be published online in three languages: English, German and Italian in 2010, and in 2019, after a complete overhaul when new discoveries and objects were added to the system that now includes around 100 unique objects. To this day, the project continues to add to our understanding of the sea silk and may uncover previously unknown data.[45]

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[42] Muschelseide: Sea silk project.
[43] Muschelseide: Sea silk project.
[44] Muschelseide: History, Sea-silk in the new millennium (2000-2020).
[45] Muschelseide: Sea silk project.

However, at the present stage of research, this is all the information we have on the Placitus locus under study, including the sources that have been discovered so far. Hopefully, further discoveries will also help to clarify my own conclusion about sea silk, namely that there was no need to further define *lana marina* because of its notoriety, or that the lack of a description of it is precisely because it was already a rare material that was known to all and therefore no further information was needed.

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