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A Superb Product of a Spinning Spindle

The Ljubljansko barje (En. Ljubljana Marshes, Ger. Das Laibacher Moor) is an alluvial plain stretching more than 160 square kilometres to the south of Slovenia's capital Ljubljana. Its formation is tectonic, and its sedimentary basin began to form during the Middle Pleistocene around 550 thousand to 400 thousand years ago.[1] At some times, the Barje was a vast gravel plain with interspersed water surfaces, and at other times it was either a shallow lake with rich fauna and flora or an impassable turf swamp. The upper part of the geological borehole at Črna vas revealed a several metres thick layer of lake marl (also called "snail marl"; Slovene: polžarica) under the surface, which is partly interspersed with sand. The presence of lake clay marl confirms that there was a lake at Ljubljansko barje since the end of the Pleistocene, and by the 2nd millennium BC it had finally turned into a swamp and then into a moor. The drying up of the Ljubljansko barje began in the 18th century when peat was used for commercial purposes, but today the plain is characterised mostly by grasslands.[2]

In Slovenia and throughout the world, the Ljubljansko barje is known as a site with pile-dwelling remains and has been entered onto the UNESCO World Heritage List.[3] Pile-dwellings were first discovered near Ig, at that time called Studenec (Brundorf), in 1875. The discovery was followed by extensive archaeological excavations that revealed impressive finds, such as uniquely decorated ceramic vessels and other objects indicating that pile-dwellers

1 Verbič, 2011.

2 Pavšič, 1989; Velušček, 2010.

3 Suter and Schlichtherle, 2009.

engaged also in metallurgy. Among the finds, there were numerous objects of organic origin: predominantly animal bones, but also many plant remains. Rarer, but all the more significant were the remains of thread and cord, which were believed to have been used for making fishing nets and textiles. Researchers were interested in the type of material excavated, and they determined that the threads and the cords were made of fibres of cattail or marsh grass.[4] Later on, shortly after the Second World War the leading Slovenian archaeologist of the time, Prof Josip Korošec, found 2-cm wide fibre bands during excavations at the Blatna Brezovica pile-dwelling. They were most likely made of flax or, less likely, hemp fibres.[5]

Similar discoveries are made elsewhere in Central Europe, where thread, cord, or even somewhat larger remains of clothing are found in wetland sites among the remains of pile-dwellings and other prehistoric settlements. Of particular significance is the discovery of Ötzi, an approximately 5,300-year-old corpse, which was mummified in a glacier in the Alps, at an altitude of 3,200 metres, right next to the border between Italy and Austria. Wearing clothes and shoes made from animal and plant material, Ötzi was well equipped for his entry into the world of the high mountains.[6] No similar discoveries have been found so far at the Ljubljansko barje. However, ceramic statuettes and anthropomorphic vessels, the so-called idols, have much to tell about a narrow segment of the clothing habits of the time. Several such discoveries were found at pile-dwellings in Ig; they are kept at the National Museum of Slovenia in Ljubljana.[7]

Researchers agree that decorative patterns found on idols represent clothes, however it cannot be claimed with certainty whether they are everyday clothes or clothes intended for more ceremonial occasions.[8] This is a highly intriguing subject; it seems that a definitive answer will never be found as long as concrete data are not available. However, one thing is true, and that is that making thread from plant fibres and then weaving it into a meaningful and useful thing (object, product) takes a great deal of knowledge: knowledge about material properties, a significant level of technical culture and of course a clearly defined purpose for the final product. A comparable debate has been triggered also by an outstanding Ljubljansko barje find, namely the remains of

4 Greif, 1997.
5 Korošec, 1953.
6 Banck-Burgess, 2016.
7 Korošec and Korošec, 1969.
8 See Miličević, 1988.

Fig. 1 – The yarn was discovered during the first days of sample trenching at Stare gmajne site in 2006. Four years earlier, a wooden wheel with an axle was found in its vicinity (photo: M. Turk).

yarn discovered during the trial trenching performed by the Institute of Archaeology of ZRC SAZU at the archaeological site Stare gmajne near Verd.

Stare gmajne near Verd is an archaeological site discovered in 1992 by archaeologist Janez Dirjec. To the general public, the site is known primarily because of the remains of a wooden wheel with an axle, i.e. an undercarriage of a two-wheeled cart. Somewhat less known but also impressive are some other finds made by prehistoric pile-dwellers living at the area of Stare gmajne, among them two well preserved oak log boats, a fully preserved child's bow, stone shaft-hole axe (weighing approximately 1 kilogram) with a partly preserved handle made of dogwood, and a small flat axe, made of jade or eclogite originating from a deposit in north-western Italy.[9]

Archaeologists have found that pile-dwellers from the Stare gmajne site were also engaged in copper metallurgy. The activity was first taken up by pile-dwellers who built the

9 Velušček, 2009.

Fig. 2 – Yarn remains immediately after the discovery (photo: M. Turk).

pile-dwelling village in the 34th century BC, and later very likely also by those who used carts. Dendrochronological analyses, radiocarbon dates, stratigraphy, and typological analysis of ceramic vessels have shown that there were two pile-dwellings on the same site. The older one dates back to the 34th century BC, while the younger one was probably settled in the second half of the 32nd century BC.[10] The remains of yarn date back to this period. Based on the stratigraphic position of the find in the upper part of the cultural layer, its age can be more accurately assessed to the last decades of the 32nd century BC.

The yarn remains were discovered on 26 June 2006 (Fig. 1). Initially, the find did not receive much attention. It seemed, at first sight, to be a shapeless bundle of plant fibre (Fig. 2), perhaps moss or grass. To determine the type of plant, it was stored in a wet condition in a plastic bag and taken to the Institute of Archaeology of ZRC SAZU, where it was quickly discovered that the find was actually perfectly preserved prehistoric threads.

As the find was rare and in an extremely good state of preservation, we hesitated no further and immediately established cooperation with Gojka Pajagič Bregar, an expert on old textiles from The Department of Conservation and Restoration of the National Museum of Slovenia. Given the impression that it was an extremely valuable find, the artefact was carefully cleaned (Fig. 3). We examined in detail the lump of interwoven charred threads which managed to survive in anaerobic conditions of the Ljubljansko barje waterlogged clayey soil and determined that it was most probably very carefully prepared material for weaving or for making ropes,[11] i.e. yarn made from plant fibres. Several techniques have to be taken to prepare such material: harvesting, rippling, retting, drying, threshing, combing and spinning (a process in which threads of any length are made by drawing out, combining, and twisting short individual fibres). The individual unit of the Ljubljansko barje yarn is formed of two thin threads evenly S-spun (Fig. 4).

10 Velušček, 2009.

11 Velušček, 2009.

Fig. 3 – Gojka Pajagič Bregar cleaning the Ljubljansko barje yarn (photo: T. Lauko).

Chemical and microscopic analyses of threads have shown that the fibres are cellulosic, therefore of plant origin.[12] SEM images, in contrast, revealed three specific clues that could help determine the plant species used for the preparation of the yarn. They were: 1) longer, straight and smooth stem fibres, 2) shorter, smooth and pointed seed fibres, and 3) spiral structures (Fig. 5). All three noticeable clues were tested against and compared to recent plant fibres, e.g. of flax, hemp, brome grass, needle grass and oat. Despite some similarities detected, we were ultimately not able to determine the exact plant species. The analyses have shown that most certainly there are two types of plant fibres, shorter seed fibres and longer stem fibres, which may have belonged to the same plant species, most probably from the *Poaceae* family of grasses. According to some archaeobotanists, the yarn from Stare gmajne is of exceptionally high quality, while such clearly visible individual fibres are very rare among archaeological finds.[13]

12 Pajagič Bregar, et al., 2009.

13 A. Rast, personal communication.

The discovery of a shapeless lump of soil, not initially recognised as being significant, turned out to be an incredible and happy coincidence. During the cleaning and studying, it became clear that the find was the charred remains of more than 5,100-year-old pile-dweller's yarn. The artefact is exceptionally well preserved and of good manufacturing quality (Fig. 6). Like the cart with an axle, this find is also a true rarity. Along with some other finds from the Stare gmajne and other Ljubljansko barje pile dwellings, it is evident that the pile-dwellers were very familiar with their natural environment; they clearly respected it and were perfectly competent to survive and thrive under its harsh natural conditions.

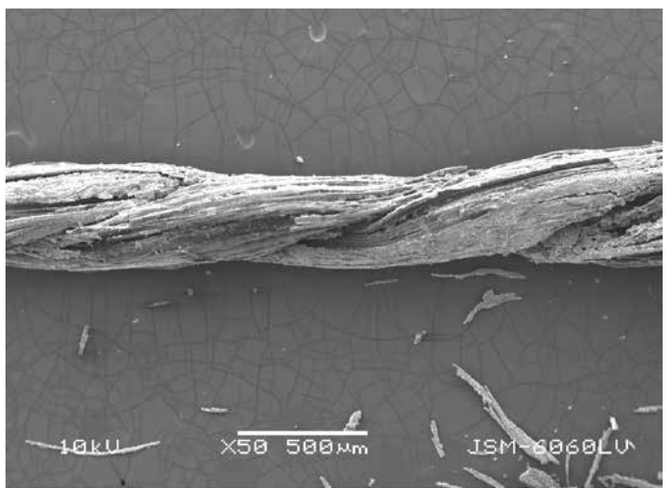

Fig. 4 – An individual unit of charred yarn is formed of two S-twisted threads made from extremely fine fibre (photo: D. Đorđević).

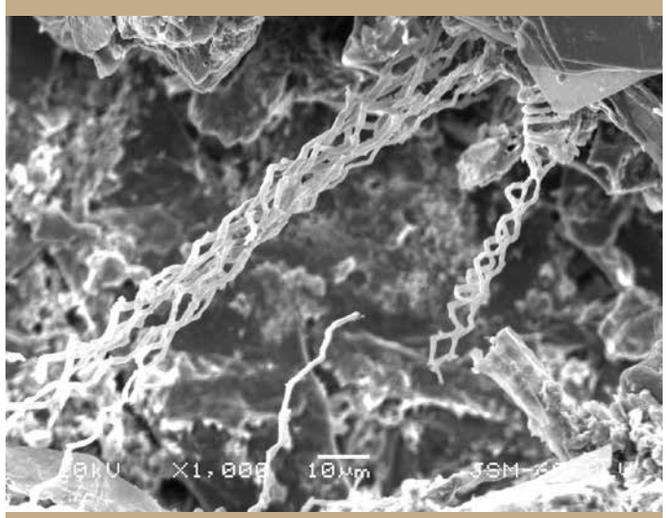

Fig. 5 – Spiral structures between fibres under a SEM microscope (photo: D. Đorđević).

Fig. 6 – The Stare gmajne yarn immediately after restoration (photo: T. Lauko).

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