

## Article

# The Construction and Functional Technology of Scythian Greaves: A Recent Find from the Elite Kurgan 6 near the Village Vodoslavka, Southern Ukraine

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**Abstract:** In the North Pontic region, bronze greaves appeared among the Scythians and noble members of the tribal world of the eastern European steppe in the middle of the fifth century BC and were used until the end of the fourth. Both the “classic” full-length Greek greaves and greaves without knee pads were in use. Surviving greaves and fragments thereof from different Scythian burials allow for analysis of the peculiarities of their construction. A distinct feature of the greaves from the burial in Barrow 6 near the village Vodoslavka, Ukraine, is a series of large openings made on the inner side of both greaves, in the area where the muscles of the calves protrude most prominently. These holes are covered (both from the inside and from the outside) with sewn-on pads made of thick leather. Similar holes can also be seen on the greaves from Kerch in eastern Crimea and were likely cut to make these greaves more suited for horse riding. The greaves from Soboleva Mogyla were additionally modified for horse riding in that the parts that covered the knees were shortened and the side parts had deep cuts (more than a half-height) on the inside of the calf muscles. Thanks to this cut, the rider’s leg (around the medial gastrocnemius in particular) fitted snugly to the horse’s side.

**Keywords:** Northern Pontic region; Scythians; protective armament; greaves; Greeks; production; leather



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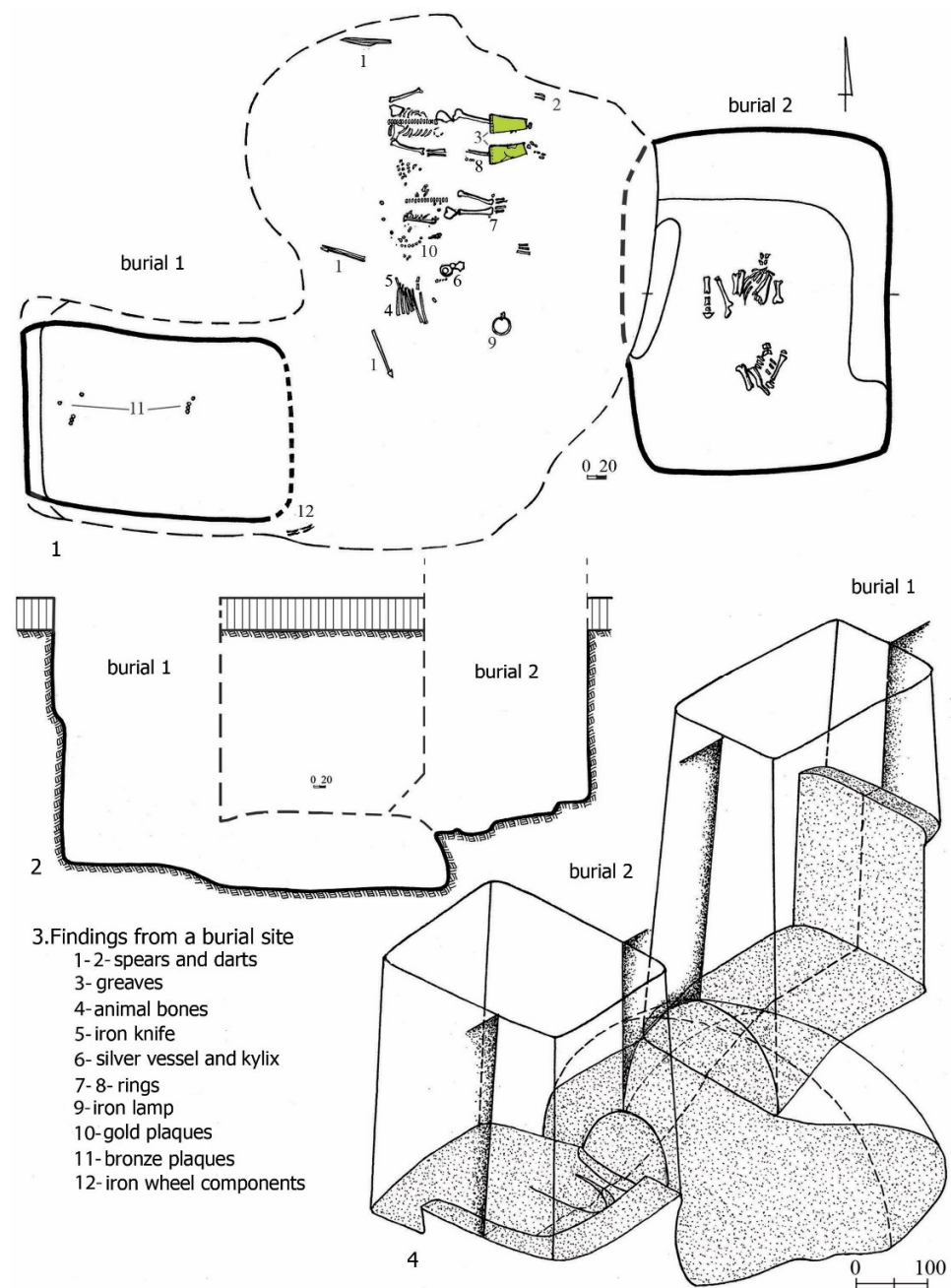
## 1. Introduction

The subject of research in this article is the bronze greaves from Barrow 6 near Vodoslavka village. Detailed analysis of the Vodoslavka greaves and several comparable finds demonstrates how the Scythian horse riders who inhabited the northern Black Sea region in fifth and fourth centuries BC adapted object types of Mediterranean origin to the requirements of their mobile lifeways. Bronze greaves from Scythian tombs have not previously been considered from the perspective of local culture and technology to highlight the ingenuity of nomadic metalworking practices. The burial ground near Vodoslavka (Novotroitskiy district of Herson oblast) was excavated by V.V. Dorofeyev’s unit of the Kherson Expedition, a project under the overall direction of A.I. Kubyshev. Despite the modest size of the barrows from this burial mound, some of them belonged to the members of the local nobility, probably at the tribal level (Daragan and Polin 2022). It should be noted that in the northern Prissivashie–northern Azov region the elite barrows are generally of relatively small size.

## 2. Barrow 6 of Vodoslavka and Its Burials

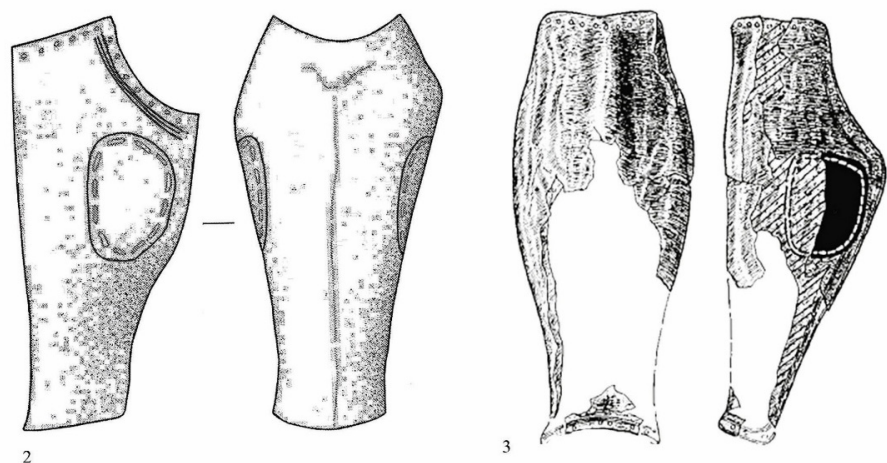
At the time of the excavations, previous agricultural plowing at the site had reduced Barrow 6 to a height of 1.4 m, with a diameter of 45 m. The barrow contained only one tomb accessed by two separate vertical shafts that had been dug at different times. Initially, a female body was conveyed into the subterranean structure through the first shaft (Burial 1); then, after some time, a man’s body was added to the shared catacomb through the second shaft (Burial 2). Furthermore, two horses were buried in the second shaft (Figure 1(1)),

providing stratigraphic evidence to show that the secondary male interment occurred through the second pit (Daragan and Polin 2020, pl. 1: 3, fig. 1: 8). At the southwestern periphery of Barrow 6, at 17 m distance from the center, another horse burial was discovered. While this burial was found in a separate pit, its construction must have been connected to the male inhumation added to the tomb through the second shaft, confirming yet again that the two deceased were buried at different times and that the primary burial in elite mounded tombs need not always be male. This scenario is further corroborated by the absence of a circular ditch around the perimeter of the tumulus, which is characteristic of Scythian barrows yielding a female primary interment. The area near the third horse burial in the southwestern part of the barrow produced stray fragments of an amphora.



**Figure 1.** Vodoslavka Barrow 6 Burials 1–2. (1)—General plan of the Burials 1–2; (2)—General section of the catacomb burial ground 1–2; (3)—Findings from a burial site; (4)—Axonometric view of the Burials 1–2 (reconstruction T. Menchinskaya).

In the shared burial chamber of Burials 1 and 2, the skeletons of a woman and a man were discovered (Figures 1(1) and 2(1)). Despite previous disturbance by tomb robbers, the remains of numerous and diverse objects indicate the wealth and relatively high social status of the buried. Among the finds are numerous gold objects which belonged to the woman (Daragan and Polin 2022, figs. 9–25), and the remains of a cart and its decorations (Polin et al. 2022, figs. 20–21). The military status of the man is clearly attested not only by the accompanying horse burials, but also by the full set of offensive weapons (arrowheads along with a bow, and a set of no less than eight spears and darts), as well as items of protective armor, including a cross belt covered with iron scales and bronze greaves.

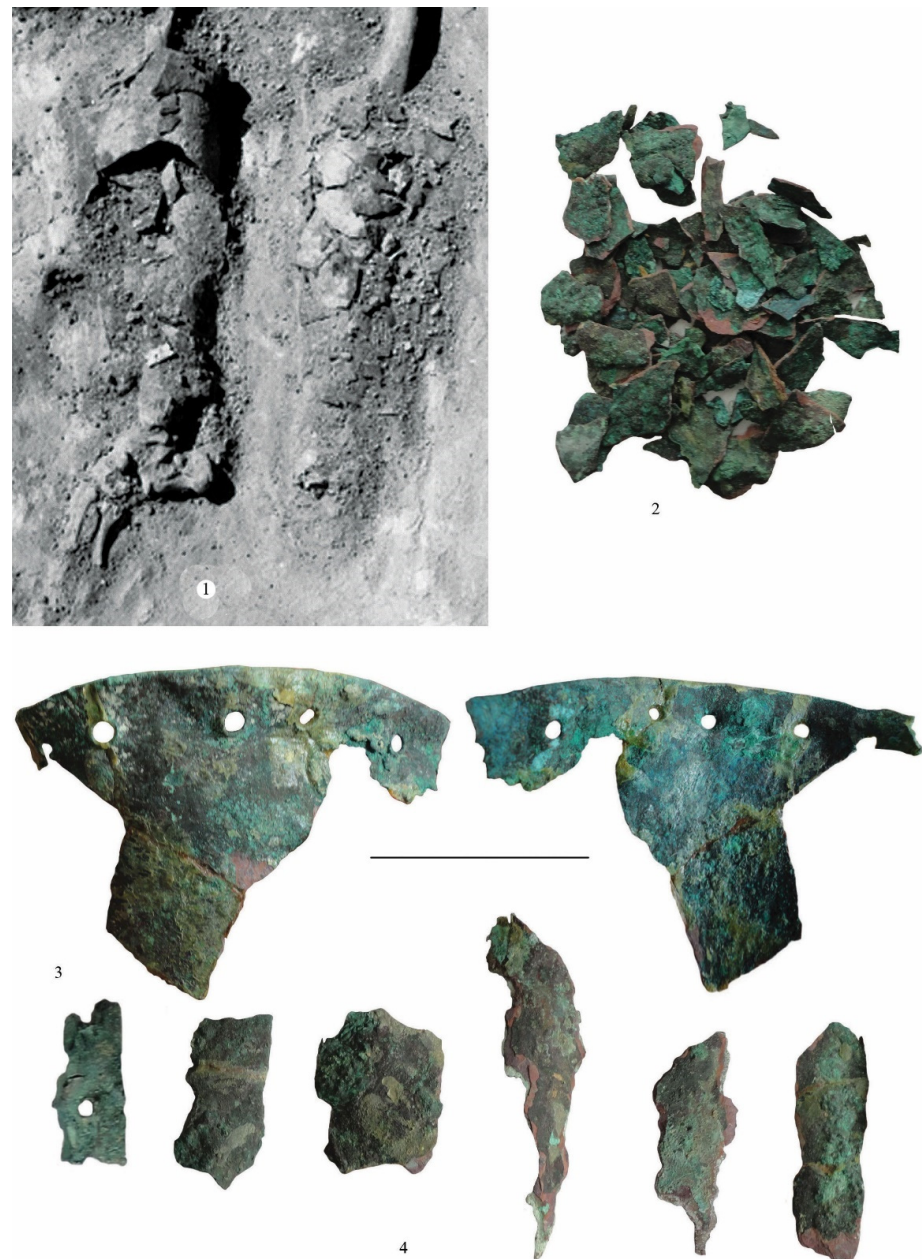


**Figure 2.** Vodoslavka Barrow 6 Burials 1–2. (1)—Skeletons of the buried. Left—female, right—male (photograph from field report); (2)—Greave from the Barrow 6. Reconstruction by E.B. Černenko (after: Černenko 2006, pl. 33: no. 665); (3)—greave from the Barrow 6. Reconstruction by S.A. Kupriy (after: Kupriy et al. 2019, fig. 5: 20).



### 3. The Greaves from Vodoslavka

As mentioned above, in the shared burial chamber of Burials 1 and 2 numerous objects—even metalwork of silver and gold—have been preserved despite the looting of the tomb. As is often the case with such rich discoveries, little attention was paid to the greaves during the clearing of the tomb. The preserved excavation records include only two field photographs that show the greaves in situ—a wide-angle shot and one taken close-up. From these photographs, it is clear that the greaves were not damaged by the robbers but by the weight of the soil and by the people conducting clearance. The greave from the left leg was especially damaged, crushed into a mass of small fragments. The greave on the right leg was somewhat less badly affected, with several bigger fragments remaining intact for restoration work (Figure 3(1)).



**Figure 3.** Vodoslavka Barrow 6 Burials 1–2. (1)—The greaves on a man's legs; (2)–(4)—Fragments of the left greaves; (3)—Upper edge of greaves; (4)—Fragments of the “body” of the greaves (1—photograph from field report; 2–4—photograph M. Daragan).



In the report of the expedition the greaves are described very briefly: “Bronze greaves in bad condition, made of a sheet of up to 1.15 cm thickness; covered from both sides with leather attached by a narrow rawhide string that was threaded through the holes in the top and bottom edges. Dimensions: length 34 cm, top width 18 cm, bottom width 10 cm” (Kurbyshev et al. 1983, p. 69). On an accompanying photographic plate (reproduced in this article in Figures 2(1) and 3), the report shows the greaves in situ on the legs of the male skeleton, alongside figures that document a cup-like silver jar and an iron brazier in their find spot (Kurbyshev et al. 1983, pl. 34, fig. 4). Overall, the documentation in this report is very confusing. The photographs reproduced on the plates were printed on the wrong side of the negative and are therefore mirror-reversed. This mistake was only discovered when the published photographs were compared with drawings in the field notes.

The condition of the greaves in the excavation photograph is quite consistent with that described in the report, though the passage in the publication stating that the greaves were “covered” with leather is confusing. Many Greek greaves have come down to us from across the ancient world, but none of them matches the description in the report. Those greaves always have a lining of leather or of a combination of materials affixed to the area of the inside leg to prevent the soldier’s calf from making direct contact with the metal and keep the protective equipment firmly in position.<sup>1</sup>

Partial restoration of the greaves took place during post-excavation conservation work. During the process, characteristic details of the design of the greaves from Vodoslavka were observed. It was discovered that the greaves were formed to match the shape of the lower part of the leg, from the knee to the feet. The report states that the details of the muscles were well-defined on the surface of the metal, in an exaggerated manner. The overall height of the greaves, 34 cm, was determined through restoration, and the thickness of metal was specified at 0.1 cm. Among the unique design features of the pair of greaves from Vodoslavka were the cutouts at the top, in the area that covered the knee joints. Furthermore, on the inner sides of both greaves, where the rider’s leg fitted snugly against the sides of the horse, there were large oval openings measuring 8 × 6 cm, which were covered with leather pads from the inside and the outside. These pads were mistakenly called inserts in the original publication, even though they cover the cutout holes and are sewn to the greaves with a narrow leather strap threaded through small holes that were pierced through the metal around both openings (see below for further discussion). As a result, it became clear that the leather cover on the outside of the greaves covered only a small section of the exterior, not the entire surface as claimed in the initial report. The reason for the existence of these holes also emerged more clearly from this renewed examination. As the greaves were used by a Scythian rider, the leather pads on the sides of the greaves, which were in direct contact with horse’s body, protected the horse from being injured by the metal of the greaves and helped to prevent the greaves from rubbing on the horse’s hair during riding (Kupriy 1994, pp. 72–73). While the contact with the polished surface of the greaves could by itself hardly injure the horse’s body, the explanation seems convincing in view of the fact that stirrups were still unknown in Scythian times. Without the help of stirrups, Scythian riders were required to use the strength of their legs and thighs to stay in the saddle. Because of this, a tight grip on the horse was extremely important in everyday life, and even more so in battle, where horses made sudden movements during maneuvering. Moreover, the removal of a section of the greaves’ metal fabric decreased their overall weight, which could have been important to counteract the relatively small size of the Scythian horses and the resulting limited ability to carry heavy loads.

On the basis of the different measurements of the objects’ dimensions provided by previous investigators, two different reconstructions were proposed. The graphic reconstruction of the Vodoslavka greaves by S.A. Kupriy, based on his work on the greaves in 1983, has only recently come to light (see Figure 2(3) (Kupriy et al. 2019, fig. 5: 19–21)).

E.V. Chernenko presented an earlier reconstruction of the greaves based on information which he had received from S.A. Kupriy.<sup>2</sup> For some reason Chernenko envisioned sizable oval openings on both sides of each greave and wrote that these holes measured

7–8 × 15 cm in size (Figure 2(2)). According to his account, the openings were covered with oval pads made of thick leather (Černenko 2006, p. 103, no. 665, pl. 33: no. 665). The recorded dimensions differ substantially from the measurements of the surviving objects. The reconstruction was carried out carelessly, without giving much thought to the actual purpose of the openings. The two side-holes were apparently depicted, for the sake of symmetry, without considering that such large openings on the external sides of the greaves would significantly lower their protective characteristics. The addition of external pads, for which there is no evidence, did not solve this problem.

The impossibility of the reconstruction is demonstrated by the technical characteristics of a modification identified on greaves from the Oloneshtskiy hoard. According to a convincing suggestion made by G.P. Sergeev, this hoard was buried by hoplites from Zopyrion's Macedonian army during the retreat after the debacle near Olbia (Sergeev 1966). In this case, the objects' modification had a completely different purpose, connected to their use by infantry. The greaves from the Oloneshtskiy hoard had too large a gap at the back of the calf. To cover it, additional bronze plaques were inserted. This "repair" demonstrates the foresight of some hoplites, who wanted to be protected from all directions, including from the back when running from an enemy.

All in all, Chernenko's reconstruction of the Vodoslavka greaves is very unreliable when it comes to the number of openings at the sides, their supposed dimensions, and especially their purpose.

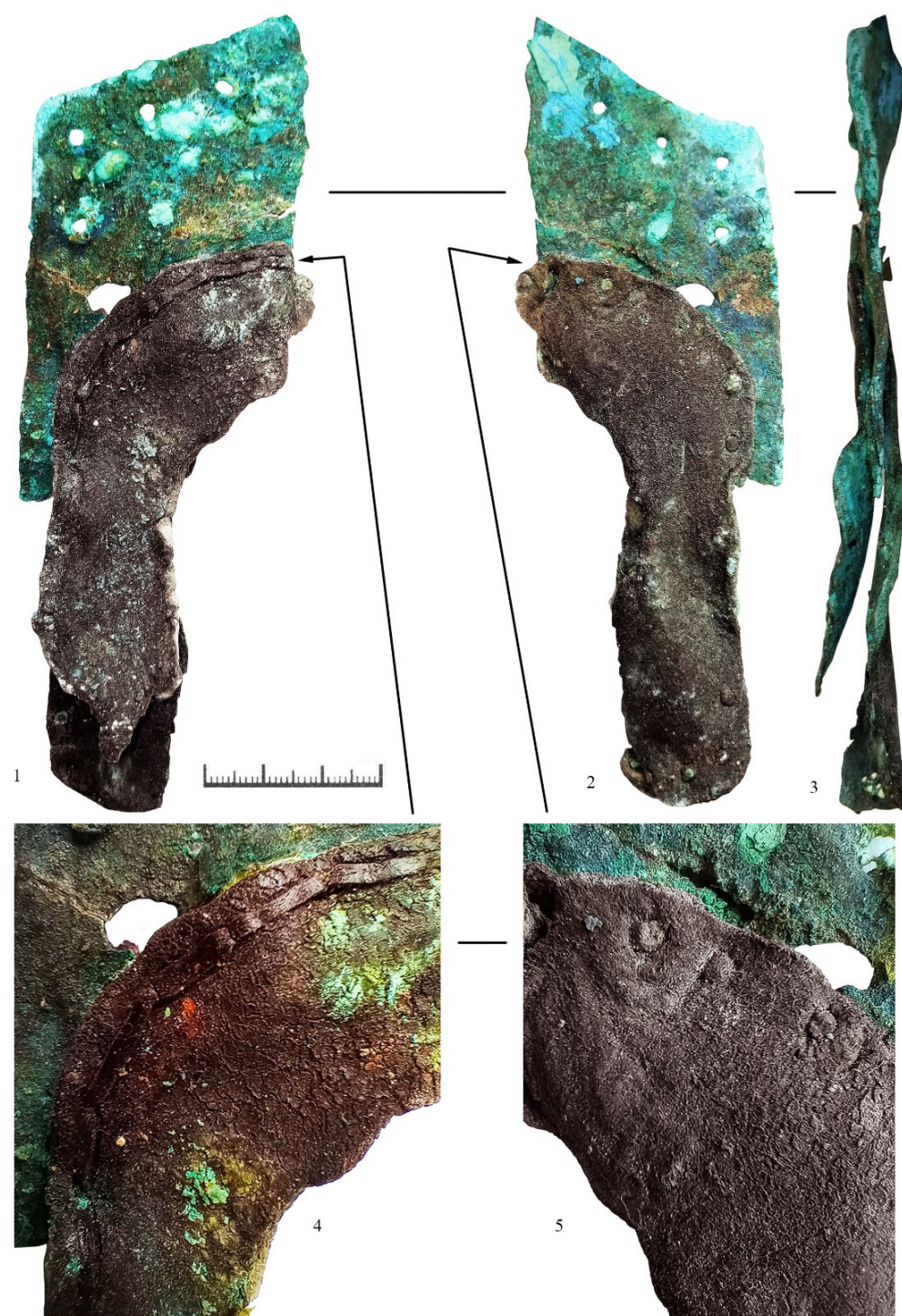
### 3.1. The Modern Condition of the Greaves from Vodoslavka

Today, the upper part of one greave and fragments of its lower part are held in the repository of finds from Vodoslavka<sup>3</sup>. Of the second greave, only some of the fragments are still available for study. Among them, the fragments of the "body" of the greaves survive, and there are very few fragments from the edges of the greaves that can provide insight into their shape. A detailed analysis of the fragments is required in preparation for the reconstruction presented further below in this article.

#### 3.1.1. Left Greave

1. A large fragment (Figure 3(3)) from the top edge of the greave, folded outward to provide a snug fit with the soldier's knee. Thanks to this flaring edge, the top part of the greave remained in good contact with the protruding knee joint without creating too much friction. Small holes were pierced along the edge from the inside (as is demonstrated by the traces of smoothed down burrs visible on the outside) for sewing the leather lining to the inside of the greave. The holes measure 0.2–0.3 cm in diameter. They are placed at 0.5–0.6 cm from the edge, with intervals of 0.4–0.9 cm.

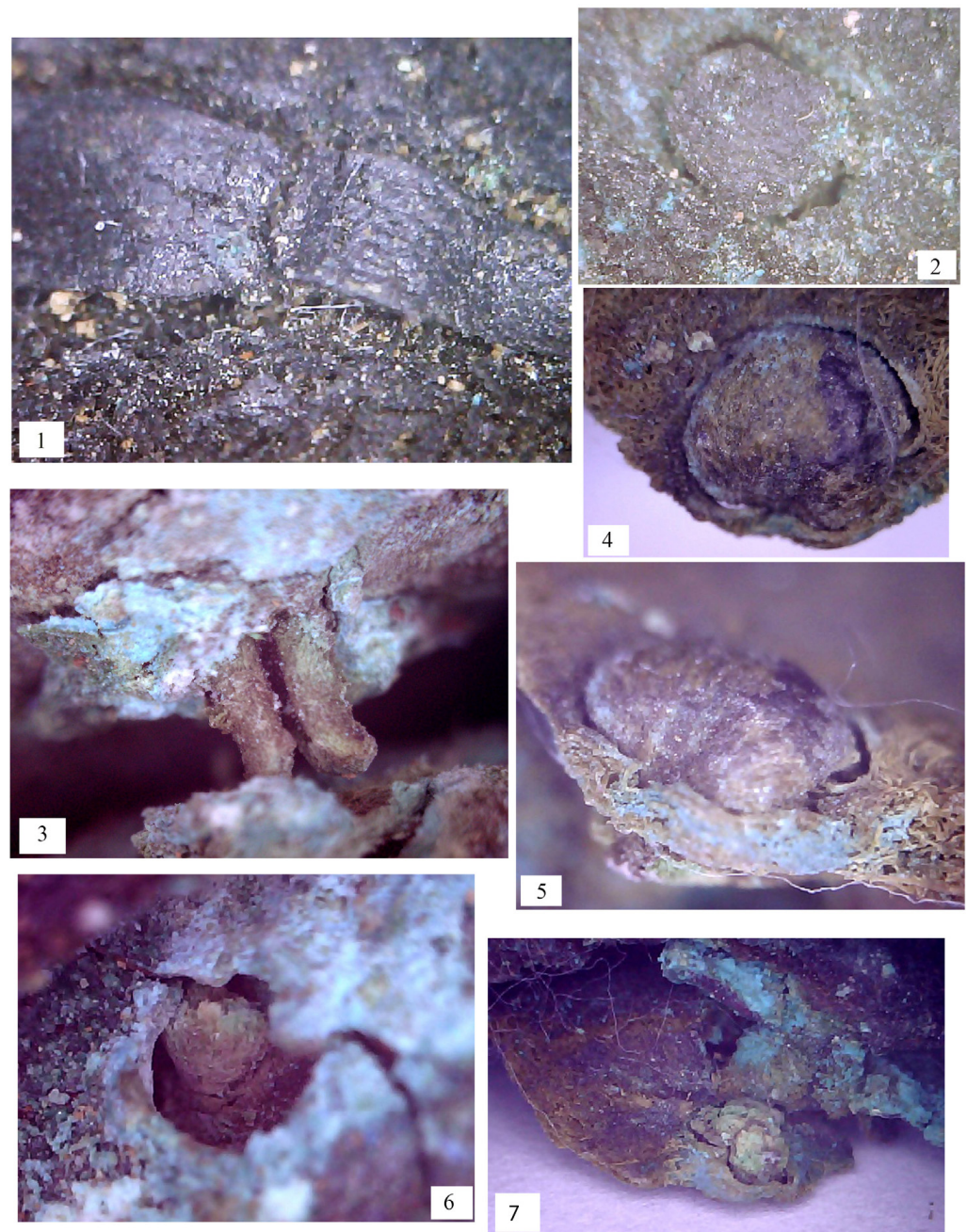
2. A fragment from the upper right calf of the greave: that is, from the side that was touching the horse's body. Two oval leather pads that were covering the oval opening from the inside and the outside are partially preserved. The pads were made of thick well-processed leather resembling suede. A fragment of a leather pad from the inner side is preserved to its full height of 9 cm (Figure 4(2)). As the bottom end of the pad is broken off on the outer side, the remaining height amounts to 7.3 cm (Figure 4(1)). Measuring no more than 4 cm, neither pad is preserved to its full width. The pads are sewn to the greave from both sides with one narrow leather strap. Wide stitches of 1.0–1.2 cm, made with a very narrow flat leather strap of 1–1.5 mm width, can easily be seen on the exterior (Figures 4(1),(4) and 5(1)–(3)). On the inside every stitch was at least 2–3 mm wide (Figures 4(2),(5) and 5(4)–(6)). It appears that on the inner side, which was in close contact with the leg, these tiny stitches were made to prevent the strap from sticking out and chafing the leg. The strap used for sewing on the pads—probably a sinew thread—is very narrow in cross section and surprisingly thin (Figure 4(1),(4)).



**Figure 4.** Vodoslavka Barrow 6 Burials 1–2. The left greave. (1), (4)—Fragment of the right side corner of the greaves on the side adjacent to the body of the horse. External side; (2), (5)—A right side-angle from the outer side of the right greave. Inner side; (3)—Lateral view (photograph M. Daragan).

3. A fragment of the upper left corner from the inner side of the left greave, measuring  $9.3 \times 8$  cm (Figure 6(1)). At 0.5 cm from the edge, a series of small holes with a diameter 0.3 cm was pierced at an interval of 0.4–1.6 cm (with filed down burrs around the holes remaining on the exterior). The holes were for sewing the lining of the greave.





**Figure 5.** Vodoslavka Barrow 6 Burials 1–2. Stitching on the leather pads with a sinewy strap. Macro photography. Zoom  $\times 20$ . (1)—Stitch on the outside; (2), (3)–(7)—Stitching of the strap through the leather overlay and metal of the greave; (3)–(7)—Stitching on the inside (photograph S. Didenko).

4. A small fragment of the side edge with three holes for sewing on the lining. On the outside of the greave a small piece of leather lining, measuring  $1.5 \times 0.7$  cm in size, remained. It was sewed to the greave with a very narrow, flat strap (Figure 6(2)), probably made of sinew. The leather pads that covered the interior openings were sewn to the greave with the same kind of strap (as seen in Figure 4(1),(4)).

5. Fragments from the sides of the greaves with edging in the form of two parallel lines chased into the surface 0.6 cm from the edge (Figure 6(3)–(6))





**Figure 6.** Vodoslavka Barrow 6 Burials 1–2. The left greave. (1)—Left side corner; (2)—Side edge with inner leather lining sewn on; (3)–(6)—Fragments of the lower part of the side edges of the greaves (photograph M. Daragan).

### 3.1.2. Right Greave

1. Better preserved than its counterpart, the right greave allows for a more complete understanding of its overall shape and construction (Figures 7 and 8(2)). The upper edge, evenly trimmed, only covered the lower part of the knee joint and with its subtle outward bend was shaped to accommodate the elevation at the upper end of the tibia. Small round holes were punched along the edge from the inside (as is clear from the remnants of burrs that can be seen on the outside) for sewing a leather lining onto the inside of the greave. The holes range from 0.2 to 0.3 cm in diameter and are located 0.5–0.6 cm from the edge at intervals of 0.4–0.9 cm. On the sides of the greave, there was a border of two or three chased lines 0.6 cm from the edge.

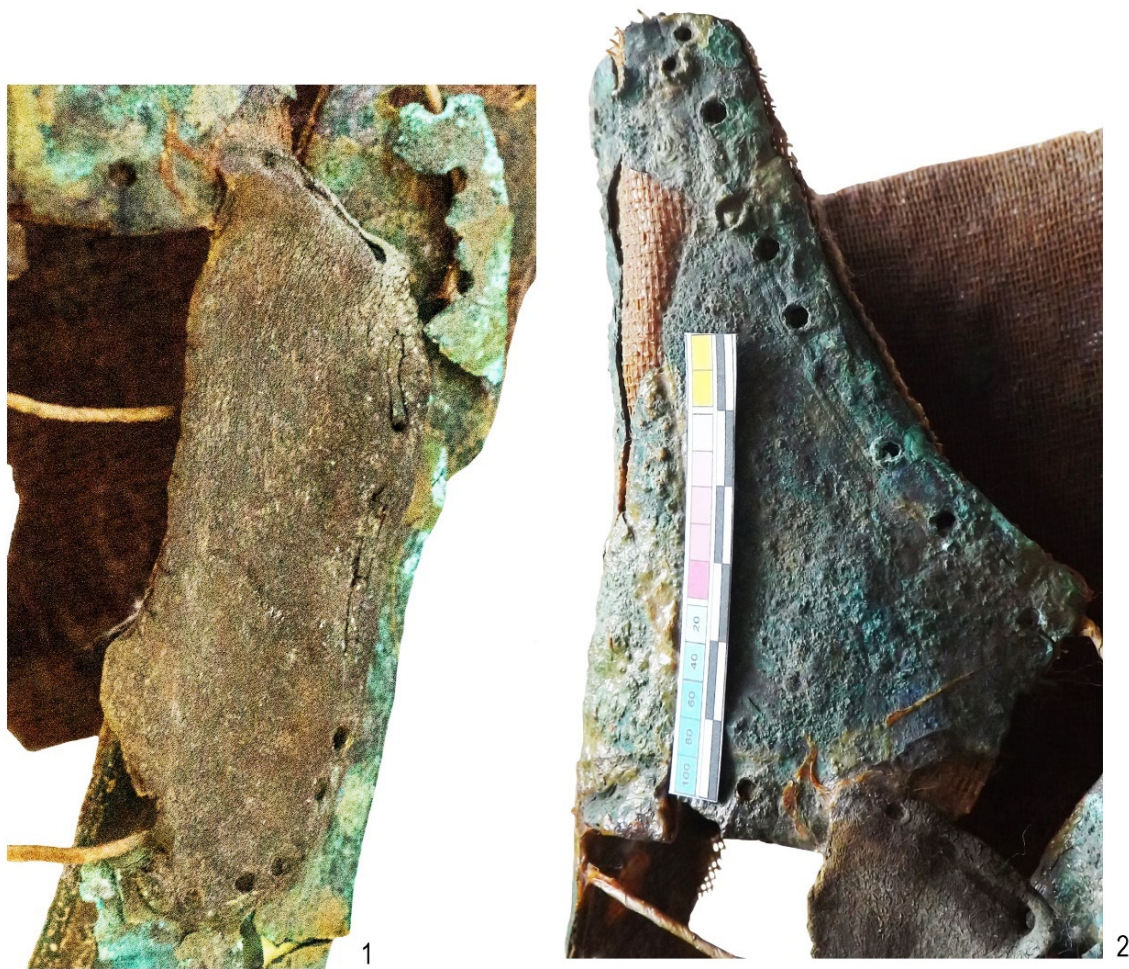
The greave completely covered the front of the leg from the foot to the knee, the outer sides, and the back of the calves. On the inside, a vertical oval opening was cut, measuring 68–70 mm in height. A series of holes was pierced along the edge at a distance of 80–84 mm from each other. Along the upper edge of the foot opening small holes of 0.3 cm diameter were punched through the bronze sheet from the inside at intervals of 0.8–1.0 cm for sewing on the lining. Furthermore, pairs of holes were punched into the curved edges of the greaves lining the top of the calves (Figure 7).

The hole was covered by a two-layered leather overlay sewn to the greave with a thin strap, one layer on either side. The dimensions of the outer leather overlay are 88 mm vertically, the distance between the holes 80–81 mm (Figures 7 and 8(1)).



**Figure 7.** Vodoslavka Barrow 6 Burials 1–2. The right greave (photograph T. Shelemeteva).





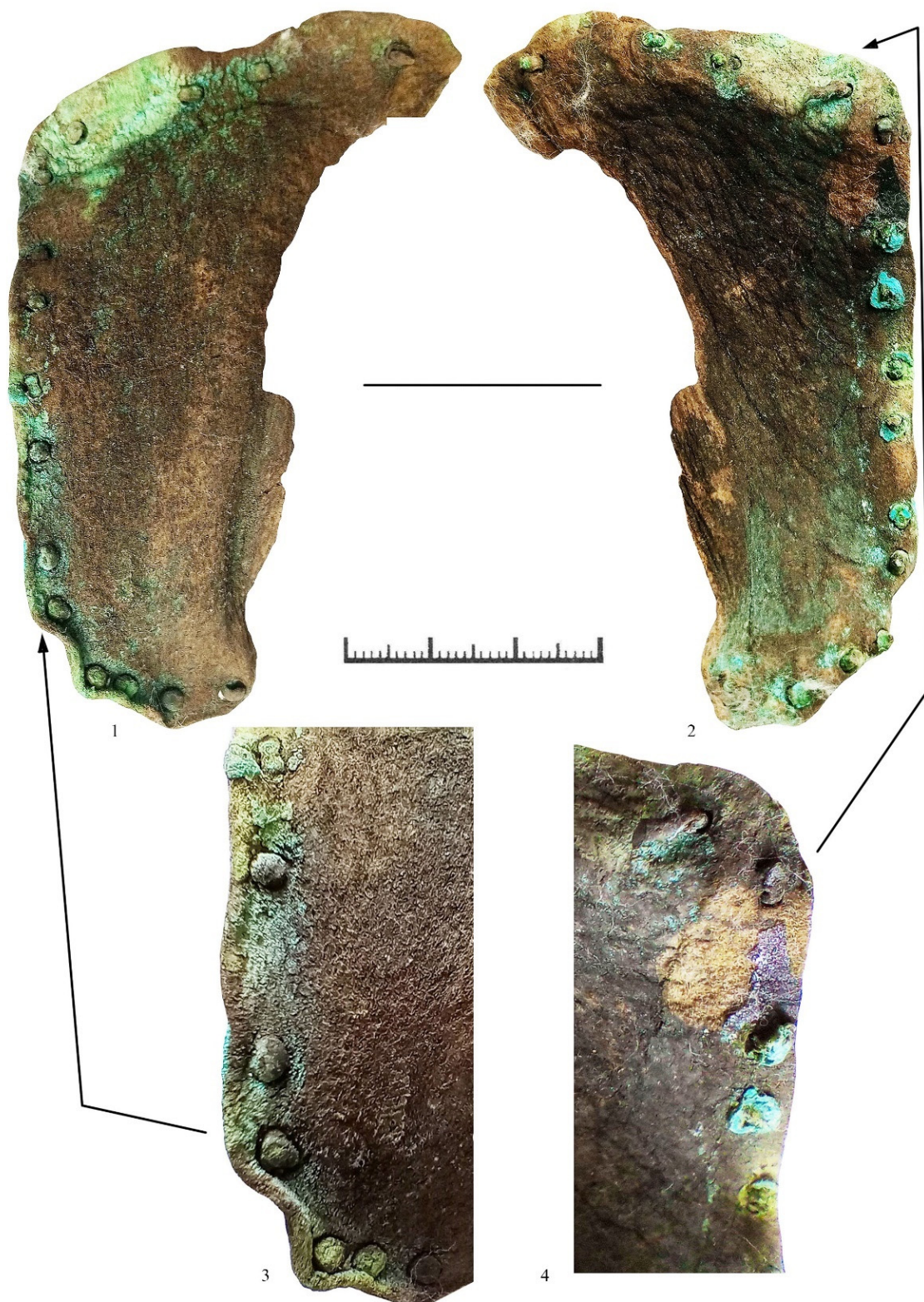
**Figure 8.** Vodoslavka Barrow 6 Burials 1–2. The right greave. Details: leather overlay covering the lateral opening (1); upper lateral section (2) (photograph T. Shelemeteva).

Separately preserved is a leather pad that covered the opening on the inner side of the right greave. The bent pad measures 8.6 cm in its current state, 9 cm when unrolled (i.e., the same as the pad on the left greave). The right side of the pad is broken off and lost. The remaining width ranges from 2.8 cm at the bottom to 5.5 cm at the top. On the inner side of the pad, a sinew strap with extremely short stitches (no longer than 0.2 cm and a distance of 0.4–1.0 cm between them) can be made out (Figure 9(1),(3)). On the side of the pad that was in contact with the inside of the greave, torn-off ends of the strap can be seen protruding. They are covered in bronze oxide, which apparently indicates the tightness of stitching—the strap was fixed so firmly to the rim of the hole that the leather fused with the corroded metal (Figure 9(2),(4)).

2. Three fragments from the bottom edge of the greave (Figure 10(1)). The restored section has a horizontal arch-shaped curve. Along the edge, small holes for sewing on the lining were pierced into the metal from the inside. They measure 0.3 cm in diameter and are placed at 0.8–1.0 cm intervals from each other. Smoothed burrs around the holes remain visible on the exterior. The length of the fragment is 9.5 cm.

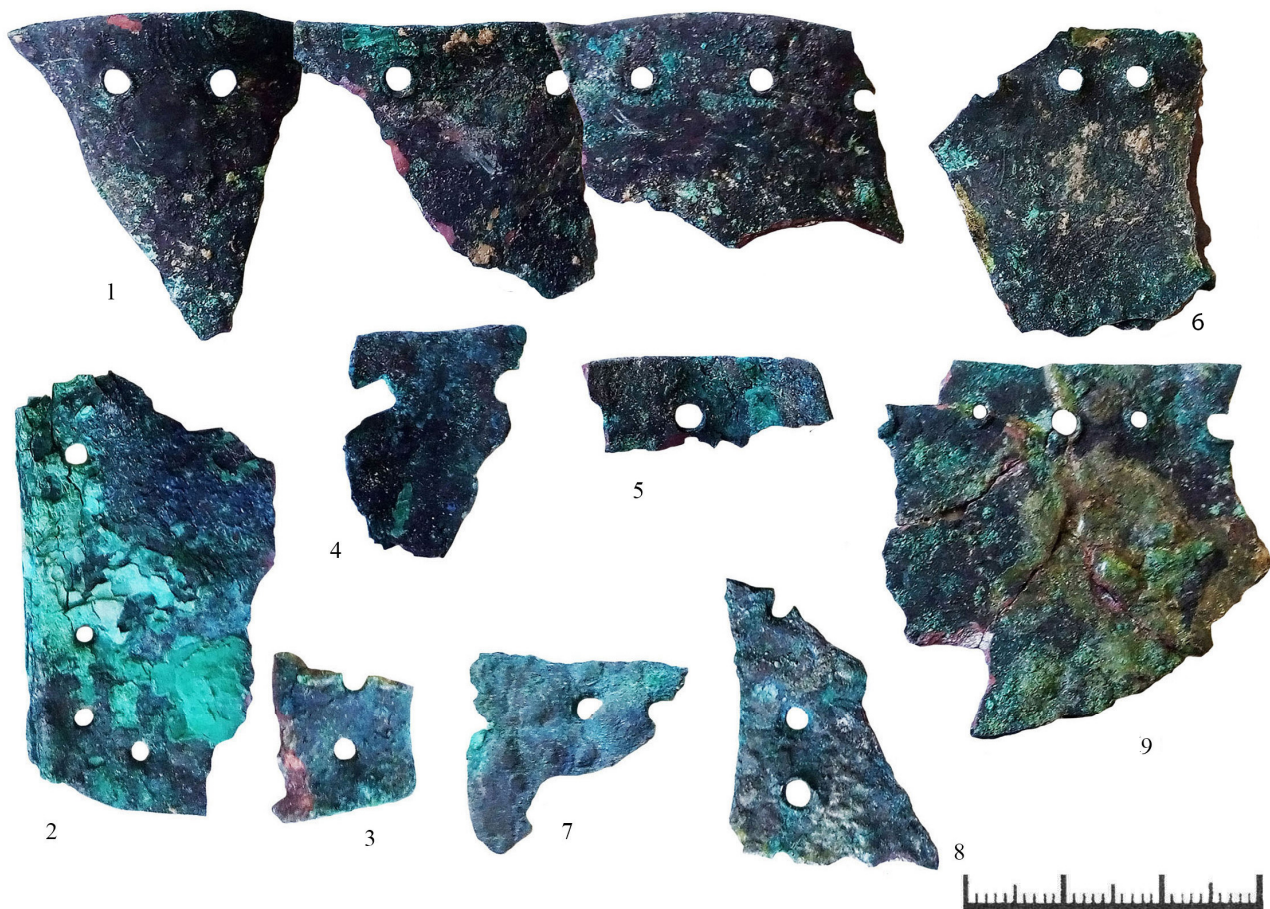
3. Two fragments from the right and left bottom corners of the greaves (Figure 10(2),(3)). Along the edges, small holes for sewing on the lining were pierced from the inside. They are of the same size and located at regular intervals between them. The dimensions of the fragments are  $5 \times 2$ –2.9 cm and  $1.9 \times 1.6$  cm.





**Figure 9.** Vodoslavka Barrow 6 Burials 1–2. The right greave. Leather overlay that covered the lateral opening. (1)—the side that adhered to the warrior's leg; (2)—the side that covered the hole and adjoined the greaves; (3)—detail of (1); (4)—detail of (2) (photograph M. Daragan).





**Figure 10.** Vodoslavka Barrow 6 Burials 1–2. The right greave. (1)—bottom edge; (2), (3)—bottom corners, right and left; (4)–(9)—lateral edges (photograph M. Daragan).

4. Assorted fragments from the side edges of the greaves, with holes for sewing on the lining pierced from the inside (Figure 10(4)–(9)). The sizes of the holes and the interval between them remain relatively regular throughout. The dimensions of the fragments vary from  $1.5\text{--}3.0 \times 1.1\text{--}3.4$  cm.

### 3.2. The Reconstruction of the Greaves from Vodoslavka

The greaves from Vodoslavka covered the rider's leg fully—the inner and outer sides of the calves as well as the shin from the feet to the knee (Figure 11(1)–(3)). The knee pads were partly removed from the greaves in order to accommodate the bent knee of the seated rider. As a result of this modification, the horizontal top edge of the knee pads only covered the lower part of the knee joint. Along the inner sides of both greaves (the sides that were in direct contact with the horse's body), large oval-shaped openings were cut out in places where the muscles of the calves jutted out the most. The holes were covered from the inside and from the outside with sewn-on oval and slightly angular pads of thick leather,  $6 \times 8$  cm in size. The pads were sewn to the greaves with an extremely thin, flat strap (probably of sinew) of 1–2 mm width through small holes pierced into the metal around the openings.

Along the sides of the greaves two grooves running parallel to the edge were chased into the metal's surface. The grooves are interrupted along the top edge of the side flaps and along the top and the bottom of the greaves, at the openings for the knee and the foot. To judge from the remaining fragments, the bottom edge of the greaves was slightly convex in outline.





**Figure 11.** Vodoslavka Barrow 6 Burials 1–2. (1)—“Pattern” of the Vodoslavka’s greaves (a—outside view, b—inside view); (2)—“Finished” greaves; (3)—rider’s leg view; (4)—Greaves from Kerch, an accidental finding (after: [Galanina 1965](#), fig. 3: 5–7).

#### 4. Discussion

In the existing literature on the subject, it is generally agreed that protective armor made of iron or bronze scales appeared in the northern Pontic region at the end of the eighth century BC (as demonstrated by the finds from kurgan Zhabotin 524) ([Ryabkova 2010](#)), and that by the seventh, the use of armor had already become fairly widespread. Initially, Scythian armor consisted of a plated shirt and a helmet of Kuban type, characterized by a tight-fitting skull cap with cutouts above the brows ([Alekseev 2019](#), p. 222). At the end of

the sixth century BC, trousers and helmets of a different design—made of metal scales of various shapes and sizes—became part of the armor. In the first half of the fifth century BC, shields and sashes made of scales were added. During the fifth and fourth centuries BC, armor of this type continued to be in use, as is shown by the finds from Novorozanovka, Gladkovshina, and other sites. In the middle of the fifth century BC, greaves of the type studied in this article finally became a part of the armor of the steppe Scythians and other tribal elites of the eastern European forest steppe. While greaves with metal scales of local manufacture had appeared at the beginning of the fifth century BC, in the middle of the fifth Greek-made greaves of forged bronze sheet came into use (Černenko 1968, pp. 112–122; 1988, p. 13; 2006, pp. 98–109). They were combined with scale armor, thigh armor and other items to form extended sets. Occasionally, bronze greaves and belts reinforced with metal scales were used alongside protective equipment made of leather or felt without metal components, which was consequently very hard for archeologists to discover. The combination of bronze greaves with other parts of armor made of leather is attested by the finds from Burial 2 of Soboleva Mogyla, Burial 1 in Barrow 9 near the village Peski, Barrow 1 of Kairy-V Tomb and Barrow 6 in Vodoslavka, Barrow 32 near the village Katerinovka, and Barrow 8 in the Pyatibratniy (Mozolevskiy and Polin 2005, pp. 353–54; Daragan and Polin 2020, pp. 119–20, fig. 5: 7–19).

#### 4.1. Finds of Greaves

Several lists of greaves found in the northern Pontic region have been assembled (Galanina 1965, p. 27; Černenko 1968, p. 112; 1988, p. 13). An early one by Galanina already included finds from 30 locations (Galanina 1965), whereas Černenko's most recent version of 2006 featured data on bronze greaves discovered in 58 locations and greaves with scales from 12 locations. But this more recent list requires some corrections (Černenko 2006, pp. 98–109, nos. 634–706, pls. 31–33). The find from Barrow 2, near the village Gladkovshina appears on the lists of both those contain bronze greaves and those containing scaled greaves (Černenko 2006, nos. 645, 697), but in fact, this burial only contained items of the latter type<sup>4</sup>. The find from Barrow 3, near the village Butova Dolina, is mistakenly included in the list of those containing bronze greaves (Černenko 2006, no. 646), yet only bronze overlays from plated greaves were found in that barrow (Murzin and Shelehan 2018, pp. 72–74). In the Barrow 3, near Novotroitskoe (Černenko 2006, no. 664), only the pieces of a scaled cuirass were found; greaves, especially bronze ones, are never mentioned in reports on the finds (Kubyshev et al. 1976, pp. 94–95). The same mistake was made in listing the finds from Barrow 3 of tomb Shevchenko-I (wrongly designated Barrow 1, tomb Shevchenko-II in Černenko's publication), where a fragment of a set of straight iron plates was found. Measuring 26 × 2 cm, the fragment could belong either to greaves or to a shield (Černenko 2006, no. 678; Zarayskaya and Privalov 1992, pp. 122, 124, fig. 2: 5). Overall, out of the 58 locations mentioned in Černenko's summary of finds, only 46 are reliably identified.<sup>5</sup> More recently, S. Polin expanded Černenko's list (Mozolevskiy and Polin 2005, p. 175; Bidzilya and Polin 2012, pp. 175). Among the find spots which Polin added to the list is Gaimanova Mogyla, where fragments of bronze greaves were excavated not only in northern Tomb 1, but also in central Tomb 2, dating, respectively, to 365–350 and 390–380 BC (Bidzilya and Polin 2012, pp. 271, 447, 510, Figs. 396, 649). Bronze greaves or the traces thereof were also found in Burial 1, Barrow 1 of the tomb Vilna Ukraina-I (Leskov et al. 1969); Burial 3, Barrow 2 (1972), from the tomb Sovhoz Suvorova near the village Bol'shaya Belozerka (dating to the quarter of the fourth century BC) (Boltrik and Shelehan 2020, pp. 91, 97); Burial 2, Barrow 29 of Sahnova Mogyla (second quarter to beginning of the third quarter of the fourth century BC), a group of barrows to the south of the same village; Burial 1, Barrow 2, near the village Bol'shaya Znamenka (second to third quarter of the fourth century BC) (Otroshenko et al. 1979, pp. 8, 67; Polin 2014, pp. 361–62, 508–9), the central tomb of Denisova Mogyla (end of the second quarter to the beginning of the third quarter of the fourth century BC) (Mozolevskiy 1980, p. 130; Polin 2014, pp. 179–80); Burial 1, Barrow 1, in the tomb of Kairy (end of the fifth to the

beginning of the fourth century BC) (Polin and Dargan 2020, pp. 119–20, fig. 5: 7–19); Burial 2, Barrow 4, near the village Illinka (second quarter to the beginning of the third quarter of the fourth century BC) (Pleshivenko 1991, p. 63, fig. 7,1; Polin 2014, p. 370); Burial 2 of Soboleva Mogyla (the middle to the beginning of the third quarter of the fourth century BC) (Mozolevskiy and Polin 2005, p. 175, cat. 23, 353–54, fig. 104: 10–11; Polin 2014, p. 480); the central Tomb of Vodyanaya Mogyla (beginning of the third quarter of the fourth century BC) (Mozolevskiy and Polin 2005, pp. 346, 57; Polin 2014, p. 465); Burial 3, Barrow 1, in tomb Kamenka-Dneprovskaya-I (beginning of the fourth century BC) (Otroschenko et al. 1986, pp. 44–45; Polin 2014, pp. 313–14); Barrow 11, Burial 3, near the village Akimovka (end of the fifth century BC) (Boltrik and Fialko 2010, p. 106); Barrow 2, Burial 3, near the village Nikolskoe (end of the fifth century BC) (Agulnikov and Sava 2004, p. 32, fig. 15: 9–10; Teleaga 2008, p. 442, pl. 173,11); Burial 1, Barrow 5 of tomb Dubossary-B (first half of the fourth century BC) (Ketraru and Chetverikov 2003–2004, p. 103, fig. 14,1); Barrow 7, near the village Pukar' (end of the fifth to the beginning of the fourth century BC) (Agulnikov et al. 2013, pp. 263, 271, fig. 10, 1–2); Barrows 3 and 11, near the village Staryy Merchik (Bandurovskiy and Buynov 2000, Figs. 8, 17; 20, 5) (second to third quarter of the fourth century BC); Barrow 33, near Pesochina (Babenko 2005, pp. 96–97) (first quarter of the fourth century BC); and Barrow 13 of the tomb Gorki-I (Gulyaev and Shevchenko 2017, fig. 17, 1). The most recent discovery of bronze greaves occurred in 2007 in Burial 4, Barrow 32, near the city Ordzhonikidze, a find dating to the second quarter of the fourth century BC (Polin et al. 2008, p. 144; Polin 2011, pp. 246–47). To date, there are therefore data on finds of bronze greaves or the traces thereof from 69 locations in the steppe and forest–steppe northern Pontic region and the northern Caucasus (Figure 12)<sup>6</sup>.

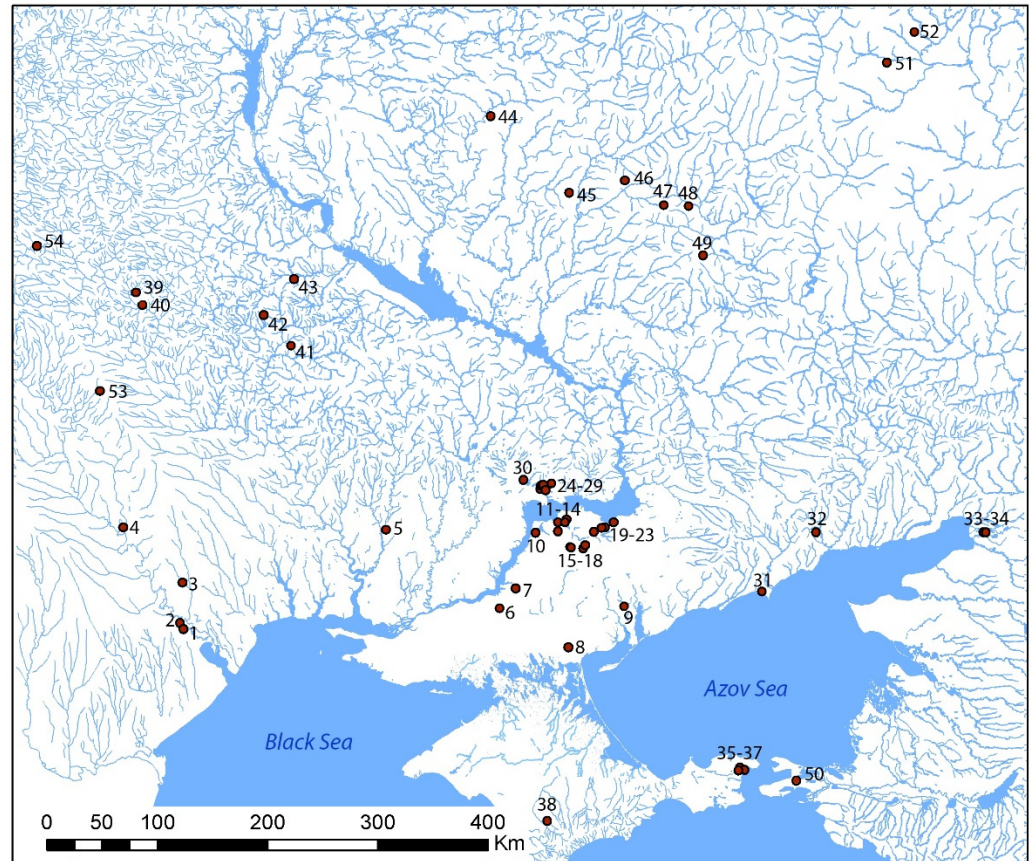
Unique greaves made of very thick leather without metallic reinforcements were found in Barrow 3, Burial 1, near the village Otradnoe (Grebennikov 2008, p. 87). What makes these greaves unique is the fact that they are preserved at all, given that objects made of organic materials hardly ever come down to us in the northern Pontic region. Despite their rarity in the archaeological record, it is very likely that such leather greaves were originally the most common type among Scythian warriors.

Galanina dated the use of bronze greaves in the northern Pontic region from the middle of the fifth century BC to the end of fourth or the beginning of the third century BC. After the first half of the third century BC, as Galanina noticed, the presence of greaves in the northern Pontic region peters out both in the archaeological record and in depictions of the figured arts of the Bosporan Kingdom (Galanina 1965, pp. 9–12). More recent work on the chronology of Scythian material culture might justify a slightly earlier date for the end of the series, no later than the end of the fourth century BC.

In previous scholarship, Černenko debated the end date of the series proposed by Galanina, arguing that greaves continued to be in use in the northern Pontic region in the second as well as third centuries BC. He cited the find of greaves in the so-called Barrow of 1949 near Scythian Neapolis (Simferopol) and the depiction of similar protective equipment on the Gazuria tombstone from Chersonesus (which in his opinion dates to the second century BC) to corroborate his assumptions (Černenko 1968, p. 120). But in Barrow of 1949, the greaves were found in the earliest burial of this mound, which is nowadays dated within the fourth century BC (Puzdrovskiy 2007, p. 22). The Gazuria tombstone from Chersonesus, on the other hand, was even then dated to the first century BC, and more recently the consensus has shifted to an even later chronology, placing the piece no earlier than AD 110–120 or 140–145 (OAK 1892, p. 26, fig. 23; Latyshev 1895, p. 12, no. 9; Latyshev 1916, p. 424, no. 471; Takhtai 1947, p. 61; Kadeev 1985, p. 69). With this in mind, we can safely conclude that the greaves depicted on the Gazuria tombstone show the realities of the Roman era, marked by the permanent presence of a Roman garrison in Chersonesus. In the second and third centuries AD, greaves were fairly widespread in the Roman army, in particular among the cavalry (Junkelman 1996, pp. 74–76, figs. 151–159). As V. Masyakin noticed, “the composition of the panoply on the Gazuria stele mostly matches the equipment of *lonchofóroi* (λαγχοφόροι), a type of Roman cavalry mentioned



in Arrian's treatise 'Tactical Arts' of 136/137<sup>7</sup>. Separated by half a century, the greaves depicted on the Roman-era Gazuria tombstone are at best very distant descendants of the Greek greaves of the fourth century BC.



**Figure 12.** Location of greaves in burials of Scythian times in the northern Black Sea region. (1)—Oloneshty; (2)—Pukar'; (3)—Nikolskoe; (4)—Dubossary; (5)—Peski; (6)—Vilna Ukraina-I; (7)—Kairy; (8)—Vodoslavka; (9)—Akimovka; (10)—Pervomaevka; (11)—(14)—Solokha, Bol'shaya Znamenka, Illinka, Kamenka-Dneprovskaya; (15)—(18)—Gyunovka, Sahnova Mogyla, Bol'shaya Belozerkka; (19)—(23)—Sovhoz Suvorova, Gaimanova Mogyla, Kurgan 11 Gaimanova Mogyla, Dneprorudnyj; (24)—(29)—Kurgan 32 near Katerinovka, Tovsta Mogya, Strashnaya Mogyla, Denisova Mogyla, Soboleva Mogyla, Chertomlyk; (30)—Vodyanaya Mogyla; (31)—Berdyanskiy Kurgan; (32)—Shevchenko; (33)—(34)—Pyatibratniy Kurgan 8 and 7; (35)—(37)—Kerch, Kul'-Oba, kurgan Kukovatsky; (38)—Scythian Neapolis; (39)—(40)—Novosel'tzy, Ilyintsi; (41)—Romneykovka; (42)—Ryzhanovka; (43)—Steblev; (44)—Aksyutintsy; (45)—Skorobor; (46)—Polkovaya Nikitovka; (47)—Staryj Merchik; (48)—Pesochin; (49)—Bol'shaya Gomol'sha; (50)—Bol'shaya Bliznitza; (51)—Gorki; (52)—Mastyugino; (53)—Krinichki; (54)—Jackovich.

The dating of Greek greaves from the barrows of the northern Pontic region before the end first half of the third century BC proposed by Galanina (or before the end of the fourth century BC, in the view of the present authors) matches the evidence that was available at the time and is further corroborated with every new find.

The internal chronology of the bronze greaves found in the Scythian barrows of the northern Pontic region remains unchanged since Galanina's publication. Only seven of them date within the second half of the fifth century BC (including the finds from Romeykovka; Steblev Barrow 3, Burial 2; Shevchenko-II Barrow 1; Akimovka Barrow 11, Burial 3; Nicolskoye Barrow 2, Burial 3; Pukar' Barrow 7; Kairy-V Barrow 1, Burial 1). The rest of the finds are dated within the fourth century BC.

#### 4.2. The Specific Features of the Scythian Greaves

Classical Greek greaves of fifth and fourth centuries BC feature relief modeling that corresponds to the main anatomical details of the leg, including the knee joint, gastrocnemius, and long parallel muscles of the shin (Galanina 1965, p. 6). The height of such greaves with knee pads could reach 47 cm at the extended front side. In the fourth century BC, some attempts were made by craftspeople beyond the borders of the Greek world to adapt the greaves to local technological conditions and ways of fighting. Among the Scythians and the inhabitants of the Kingdom on the Cimmerian Bosphorus, these attempts were dictated by the fact that the greaves were commonly used by cavalry. Galanina noticed that greaves from Kurdzhips and Kerch had their knee pads removed in an intentional modification (Galanina 1965, p. 12, fig. 3: 1,2,5–7). A pair of greaves from Kerch featured large openings of 11–12 × 5–6 cm with small holes around them that had been purposefully cut into the inner sides of the greaves. These sizable openings escaped the attention of previous researchers (Figure 11(4)). Due to the lack of analogies, it was most likely hard to comprehend and explain these cuttings. Moreover, the accidental discovery of the greaves from Kerch probably suggested that later changes might have been made by the person who had found them. The find from Vodoslavka shows that the presence of such openings was not arbitrary and offers new evidence for explaining their appearance. Just as in the pair from Kerch, the adaptation of these greaves was determined by the needs of a horse rider. The greaves from Soboleva Mogyla are even more distinctive in this regard. The section covering the knee was shortened to prevent it from protruding whilst the rider was mounted and potentially cause injury, and a deep cut of more than a half of the greave's height was made on the inner side (Figure 13). Thanks to this cut-out, the rider's upper calf fit snugly against the side of the horse (Mozolevskiy and Polin 2005, p. 353, fig. 104: 10–11).

The knee pads were also removed on the greaves from Burial 1, Barrow 9, near the village Peski (Grebennikov 2008, p. 87, fig. 36: 2) and from Burial 2, Barrow 4, near the village Illinka. The greaves from Illinka resemble the ones from Vodoslavka in that they had lines engraved along the perimeter of their edges but differed in so far as they had only four holes on the top edge and a couple holes of 3 mm in diameter at the bottom corner and on the outer edge of the side (Figures 14(5)(6) and 15(8)). At the top of the left greave from Illinka a fragment of a 1.2 cm wide strap remained. It allows us to conclude that the greave was attached to the leg with straps that hugged the leg below the knee and above the ankle (Pleshivenko 1991, p. 68, fig. 7: 1). This method of fitting the armor to the leg would explain the five bone beads found in Barrow 13 of the cemetery Gorki-I. The beads were probably attached to the ends of the thin leather straps that were used to tie the greaves to the leg (Gulyaev and Shevchenko 2017, p. 32, fig. 17, 2–6). The truncated conical bone beads from the burial Vodoslavka 8 might have served the same purpose, but the proposition remains hypothetical owing to the lack of a precise find spot within the grave assemblage.

The earliest greaves currently known with removed knee pads in the northern Pontic region were found in Burial 2, Barrow 3, near the village Steblev and measure 35 cm in height (Figure 14(1),(2)) (Skoryi 1997, pp. 35, 82). Like the examples from Vodoslavka, the greaves from Steblev had holes of 1.5 mm in diameter pierced along the top edge and the top parts of the sides for sewing on the lining as well as lines chased along the side edges to form a border (Figure 14(3)).

The data currently available allow us to suggest that if the removal of knee pads was documented in the fifth century BC as the first modification, then the other alterations to the design of the greaves that we came across date from the second to third quarter of the fourth. In Figure 15, some ways in which the Scythians upgraded Greek greaves are shown in comparison with the standard design of classical Greek or Macedonian counterparts of the second and third quarters of the fourth century BC, exemplified in the finds from Grave A of Derveni and the Graves 2 and 3 from Vergina. The first modification, illustrated in Figure 15(2),(8), is the removal of half of the knee pad; the second, as seen in Figure 15(3),(4), is the cutting of the lateral openings; the third is the removal of most of the side flap (Figure 15(6)). At the same time, the Scythians continued to use full greaves of Greek or



Macedonian type (or Vergina—Derveni type) as attested by the finds from Katerinovka, Barrow 32; Pervomaevka Barrow 4, Burial 8 (Figure 16); Gorki-I Barrow 13; and others (Figure 15(1),(5),(7)).



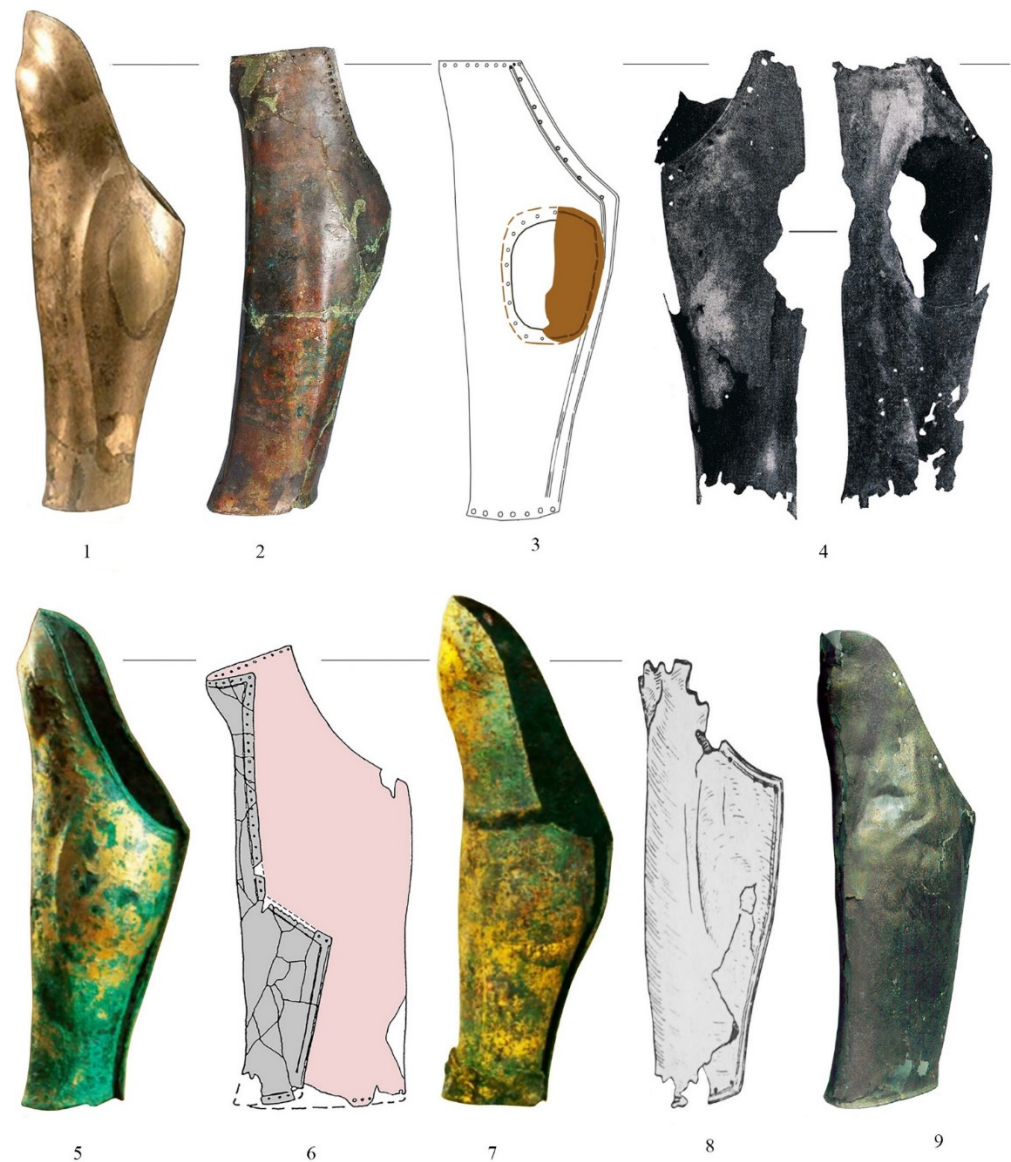
**Figure 13.** Greaves from Soboleva Mogyla Burial 2. (1)–(5)—The right greave; (6)–(7)—The left greave ((1)–(3), (6), (7)—photograph M. Daragan); (5)—Drawing (after: [Mozolevskiy and Polin 2005](#), fig. 104: 10–11).



**Figure 14.** Greaves from Scythian kurgans with cut knee pads. (1)–(4)—Steblev Barrow 3, Burial 2 (photograph T. Kurgina-Kovalenko); (5)–(6)—Illinka Barrow 4, Burial 2 (photograph A. Antonov).

Let us turn our attention to the fact that most greaves—Scythian and Greek as well as Macedonian—feature an edging consisting of one, two or three chased lines running parallel along most of the perimeter of the bronze sheet. Such a border was present on the greaves from, for instance, Barrow 6 in Vodoslavka; Burial 2 of Soboleva Mogyla; Burial 2, Barrow 4, near the village Illinka; Burial 1, Barrow 9 near the village Peski, Pyatibratniy Barrow 8; and Barrow 13 in cemetery Gorki-1.





**Figure 15.** Variants of modifications of bronze greaves in the northern Black Sea area. (1),(5),(7)—Normal greaves; (2),(8)—Cutting of the kneecap; (3),(4)—Cutting of the kneecap and cutting of large holes in the sides; (6)—Cutting the kneecap and removing more than half of the side ((1)—Derveni tomb A (after: Themelis and Touratsoglou 1997, pl. 7:A15); (2)—Steblev Barrow 3, Burial 2 (photograph T. Kurgina-Kovalenko); (3)—Vodoslavka Barrow 6; (4)—Kerch, an accidental finding (after: Galanina 1965, fig. 3: 5,6); (5)—Vergina Tomb 2 (after Andronikos 1984, p. 187); (6)—Soboleva Mogyla Burial 2 (after: Mozolevskiy and Polin 2005, fig. 104: 10); (7)—Vergina, Tomb 3 (after: Andronikos 1984, p. 216); (8)—Illinka Barrow 4, Burial 2 (after: Pleshivenko 1991); (9)—Illintzi K.493 (after: Piotrovski et al. 1986, no. 216)).

#### 4.3. Who Was Manufacturing the Greaves?

Whereas plated armor in all its varieties was apparently produced by the Scythians themselves (as is indicated by the lack of imported equipment of this type), the situation was different in the manufacture of greaves. The greaves of organic materials with bronze or iron overlays were obviously produced in the northern Pontic region by the Scythians themselves and are represented in the archaeological record half a century earlier than the examples made entirely of bronze. This transition from locally produced to imported items provides clear evidence for the relevance of this kind of protective armor to Scythian

lifeways and demonstrates that its appearance as a component of Scythian protective armor was not accidental.



**Figure 16.** Pervomaevka Barrow 4, Burial 8. After G. Evdokimov (photograph and drawing from the personal archive of S. V. Polin).

As for the place where the bronze greaves were produced, different researchers have different opinions. L. K. Galanina and E. V. Černenko considered all full-metal greaves to be Greek-made imports ([Galanina 1965](#), p. 15; [Černenko 1968](#), pp. 121–22; [1988](#), p. 17). A. I. Melyukova hypothesized that some of them could have been made in local workshops located in the cities of the Bosporan Kingdom ([Melyukova 1964](#), p. 76). More recently, S. V. Polin suggested that the distinctive cavalry greaves from Soboleva Mogyla—shortened at the knees and with cuts on the sides—could have come from the northern Pontic region ([Mozolevskiy and Polin 2005](#), p. 353). We can only guess whether the modification of the Greek bronze greaves was carried out by Greek bronze workers or whether the Scythian craftspeople or users were redesigning the items or even making them from scratch according to local functional requirements. The Scythians certainly had the technical capabilities for undertaking such alterations.

We should also emphasize that greaves were not mass-produced. Their making required accurate measurements and consideration of their intended owner's anatomical characteristics. Since only specialized craftspeople could produce such custom-made objects, it seems likely that the greaves were made to order ([Rustoiu 2012](#), p. 166). The differences in the design of the greaves and the different sizes of the surviving greaves with cut off knee pads further substantiate this supposition. The recorded dimensions of the objects range in height from 28 cm for the greaves found on the legs of a teenager from Burial 1, Barrow 9, near the village Peski to 34 cm for the examples from Barrow 6 near Vodoslavka; 35 cm in Burial 2, Barrow 4 near Illinka; 37 cm in Burial 2 of Soboleva Mogyla; and 35 cm in Burial 2, Barrow 3 near Steblev. Last but not least, the difference in



the placement of the holes and the chased edging on all of the greaves also indicates that these items were custom-made<sup>8</sup>.

#### 4.4. Who Wore Greaves?

Among the steppe Scythians of the second to third quarter of the fourth century BC, greaves were discovered only in tombs of the elite, such as those of Burial 2 in Soboleva Mogyla, Burial 1 in Peski Barrow 9, Burial 2 in Illinka Barrow 4, Pyatibratniy Barrow 8, and Burial 3 in Kamenka-Dneprovskaya-I Barrow 1. The burials included inhumations of single males as well as those of couples, as in Barrow 6 near Vodoslavka and Burial 32 near the town Ordzhonikidze. In the latter tomb, fully preserved greaves remained on the legs of a buried warrior, despite previous looting of the site.

In burials that were destroyed by robbers, the presence of greaves was also documented through the marked accretion of bronze oxide deposits on the calves. Such traces have been recorded, for instance, in the Scary Grave (Strashnaya Grave), Berdyanskiy Barrow, Vodyana Mogyla, Denisova Mogyla, Burial 1 in Bol'shaya Znamenka Barrow 2, Burial 2 in Bol'shaya Belozerkka Barrow 29 (Sahnova grave). In Barrow 2, Burial 3 of the grave Sovhoz Suvorova near Bol'shaya Belozerkka, the oxide accretions were accompanied by small bronze fragments. All surviving greaves were found in situ on the body of the deceased, except in Pyatibratniy Barrow 8, where the greaves rested against the northern wall of the tomb.

In general, bronze greaves were relatively rare among the Scythians of the northern Pontic region and were available only to members of the elite. Judging by the find in Barrow 3, Burial 1, near the village Otradnoe of greaves of very thick leather without any metal overlay (Grebennikov 2008, p. 87), it appears that common Scythian soldiers were accustomed to using comparable items made of organic materials. Whereas in Greece such greaves were normally worn by heavily equipped infantry men, in Scythia they were almost always used by the cavalry.

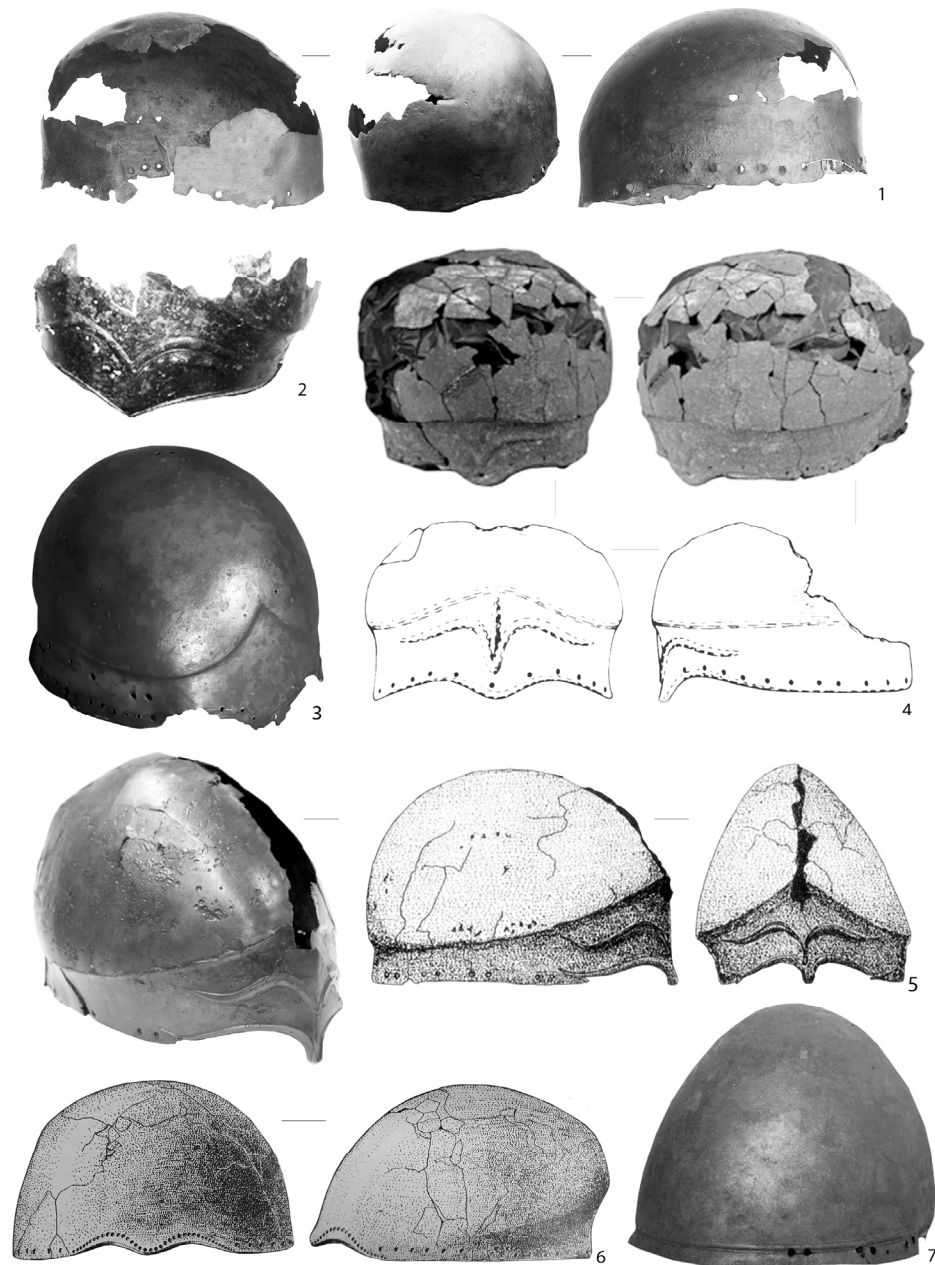
## 5. Conclusions

The findings presented in this article show that the co-existence of the diverse populations of the northern Black Sea region with the Greeks of the coastal cities initiated dynamic mutual exchanges in material culture and technology. During this process, the Scythians borrowed some types of Greek protective equipment and modified them to meet the demands of their mobile lifeways and military strategies. Thus, the horse-borne warriors of Scythia and the Bosporan Kingdom adapted Greek greaves for riding by cutting off the knee pads, which were shaped in relief to fit the anatomy of the wearer's legs in upright stance, and by making incisions on the inner side of the object, where the rider's gastrocnemius muscle is in contact with the horse's flank and no protection from armor is needed.

Greaves are by no means a unique illustration of how Scythian riders transformed items of Greek protective equipment to fit their needs. Another key item of the hoplite panoply, the bronze helmet designed for fighting on foot was in some instances converted for horseback combat conducted remotely with spears, darts, and bow and arrow. Given that such cavalry engagements rarely involved direct contact with close-range offensive weapons, several standard elements of Greek helmets were superfluous, including the large cheek pieces, ear plates and neck guard. Unlike the hoplite, the rider in combat relied on a greater range of peripheral vision, which was achieved by trimming standard hoplite helmets (Figure 17).<sup>9</sup> The modified helmets were not only lighter but also enabled the rider to turn his head more readily.

All too often, items of Greek manufacture discovered at inland sites in the northern Black Sea region are published in archaeological literature as mass data without adequate attention to the local context and characteristics of the individual objects. As dots on a distribution map, such finds are too easily mobilized to substantiate simplistic accounts of cultural influence or borrowing that cast local populations in a passive role. The more we

learn about these objects, however, the less convincing is the model of one-way cultural diffusion or Hellenization to which many traditional treatments of the northern Black Sea area subscribe. The bronze greaves from Scythian sites discussed in this article present one of many potential case studies to demonstrate how detailed object analysis can enrich our understanding of the cultures and societies of the ancient world.



**Figure 17.** Trimmed helmets. (1)—Nadezhda (after: [Polin and Koltukhov 2014](#)); (2)—Talaevski kurgan (after: [Koltukhov and Senatorov 2015](#)); (3)—Solokha (after: [Mantsevich 1987](#), cat. 35); (4)—Artsy (after: [Černenko 2006](#), cat. 600; [Alekseeva et al. 2021](#)); (5)—Konski Razdory (after: [Pleshivenko 2013](#)); (6)—Nikolskoe (after: [Zasetskaya 1977](#), fig. 28); (7)—Kardashinka (after: [Černenko 2006](#), cat. 610; [Kostenko and Abikulova 2016](#)).

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**Conflicts of Interest:** The authors declare no conflict of interest.

## Abbreviations

НА ИА НАНУ	научный архив Института археологии Национальной академии наук Украины
SEAT	Studien zur Eisenzeitlichen Archäologie Thrakiens
ВДИ	Вестник Древней Истории
АСГЭ	Археологический сборник Государственного Эрмитажа
КСИИМК	Краткие сообщения института истории материальной культуры
АДІУ	Археологія та давня історія України
АМА	Античный мир и археология
САИ	Свод археологических источников
МАР	Материалы по археологии России
КСИА	Краткие сообщения Института археологии
ДАС	Донецкий археологический сборник

## Notes

- Large collections of archaeologically documented examples can be found in Kunze (1991) and Baitinger (2011).
- The catalogue mistakenly indicates Barrow 4 near Vodoslavka village instead of Barrow 6; see Černenko (2006, no. 665).
- The greaves are held in the National reserve “Khortytsia” in Zaporizhzhya.
- In the first case, there is a reference to an excavation report; in the second, a reference to a publication. The information appears to have been summarized as it appeared without verification.
- While the inclusion of the finds from the Taman peninsula within northern Pontic Scythia is generally acceptable, the finds from the barrows of the necropoleis of Anapa, Teberda and Vanya (see Černenko 2006, nos. 688, 693, 694) need not be connected with the Scythians or even Scythia.
- The work on greaves and trousers made from metal plates is part of a separate study for which data is being collected.
- Masyakin (2021, pp. 190–91). Arrian (*Tact.*, 4. 2–4) mentions *lonchofóroi* as a separate species of spear-bearing cavalry. Diodorus (XIX:29. 2; 39. 2) and Plutarch (*Eumen.*, 18. 4) also mention this type of cavalry, which was recruited into the army of Antigonos I Monophthalmus in Media.
- Metallographic analysis of the greaves from Vodoslavka, Soboleva Mogyla and Katerinovka showed that only oxide was preserved, no metal.
- Such helmets with trimming came to light in burial mounds near the village Nadezhda, in the secondary burial of the Solokha barrow, in the Talaevski kurgan, Burial 1 from Artsyz and Burial 1 from Konski Razdory. For discussion, see Pleshivenko (2013); Polin and Koltukhov (2014, pp. 317–22). To the east of Scythia, in the Lower Volga region, the same type of converted helmet was found in a Sauromatian context, Barrow 1 near the village Nikolskoe (Zasetskaya 1977, pp. 215, 219, fig. 28).

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