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THE ANCIENT SLING[1]

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Cuvinte-cheie: praștie, tragere, tehnică antică de aruncare cu praștia, muniție, reconstituire
Key words: sling, shooting, ancient slinging technique, ammunition, re-enactment

INTRODUCTION

Over all periods of the past, slings were the weapons with the longest history and most widespread use. They were used for both hunting and warfare, but also for signaling and scaring the enemy. The most famous legend about slinging is the one of David and Goliath[2]. It is mentioned and elaborated in the paper about slinging in the biblical world[3]. Moreover, slings are mentioned by several ancient authors and owing to that, the greatest knowledge about shapes and usage of slings is connected to Roman times.

After reviewing a wide range of ancient written sources about slings, this paper will bring descriptions of slings' composition and slinging techniques. Further on, it will illustrate the possible usage of slings in re-enactment events and festivals. Although re-enactment and historical events are rather widely spread in Western Europe, they are little known in Eastern Europe, the Balkan countries being among them. In other words, in these parts, they are only in their initial phase. This is why it is very important to present as much archaeological knowledge and as many results of excavations and research as possible to the public, in order to get them more interested and raise awareness about the common cultural heritage. Since slings are rather easy to make and the related expenses are low, they represent an ideal teaching tool to work with.

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[1] Composing this paper would not have been possible without the data, advice and support of our colleagues and members of the re-enactment group "Popolo di Brig", Livio Asta, M.A. (president) and Andrea Guareschi, M.A.
https://www.scribd.com/document/158426593/Construccion-de-Hondas (accessed January 2022).
[2] *1 Samuel 17*:1-53. The First Book of Samuel is part of the Old Testament.
[3] Seevers 2018.

SLINGS IN ANCIENT WRITTEN SOURCES

Herodotus mentions slingers in his "*History*", saying that the tyrant of Syracuse, Gelon, sent 20,000 soldiers to help the Greeks against the Persians. Among them, there were 2000 slingers[4]. Thucydides mentions 700 slingers from Rhodes, along with 5000 hoplites and 480 archers as members of the expedition that took place in 415 BC and was led by the Athenians against Syracuse[5]. Further mentions of slingers by Thucydides include book 4, chapter 100, book 6, chapters 22, 25 and 69 and book 7, chapters 31 and 42. In his work "*Anabasis*", Xenophon mentions slingers in book 3, chapters 3 and 4, book 4, chapter 3 and book 5, chapters 2 and 6. He also mentions them in "*Cyropaedia*", book 1, chapter 5, book 2, chapter 1, book 3, chapter 3, book 6, chapter 2 and book 7, chapter 4. Finally, in "*Hellenica*", he mentions slingers of the Marganians, Letrinians and Amphidolians in book 4, chapter 2.

Numerous mentions are encountered in Appian's "*Roman History*", for example in "*Hannibalic War*", chapter 4, in "*Wars in Spain*", chapters 14 and 15, or in "*Mithridatic Wars*", chapter 5. They are present in "*Punic Wars*", chapter 7, "*Syrian Wars*", chapters 4 and 6 and "*The Civil Wars*", book 2, chapters 8, 10 and 11 and book 5, chapter 3. Strabo's "Geography" contains data of this kind in book 3, chapter 5, book 4, chapter 6, book 9, chapter 5 and book 14, chapter 2. In his work "*Ab urbe condita*" Titus Livius mentions Punic (Balearic) slingers and says that in Africa there were 870 of them[6]. Further mentions of slingers by Titus Livius include "*The History of Rome*", book 22, chapter 37, book 24, chapter 34, book 27, chapters 2, 12 and 38, book 36, chapter 18, book 37, chapters 40 and 41, book 38, chapters 21 and 29 and book 42, chapters 57, 58 and 59. Caesar also mentions the usage of slings in his work "*De bello Gallico*". He mentions the death of the Roman legate Lucius Aurunculeius Cotta, who was killed by a sling bullet during an attack by the Eburones led by Ambiorix in 54–53 BC[7]. Further mentions are to be found in book V, chapter 43 and book VII, chapters 18, 80 and 81. Pseudo-Aristotle mentions in his work "*De mirabilibus auscultationibus*", chapter 90, that some Ligurians shoot with a sling so well that, when they see several birds, they decide among themselves which each one should prepare to hit, because they are convinced they can easily hit them all.

Images of slingers from Antiquity are also known, for example the image of a Greek slinger depicted on a red-figured amphora from Nola, dated

[4] Herodotus, book VII/158.
[5] Thucydides, *The Peloponnesian War*, book 6, chapter 43.
[6] Titus Livius, *The History of Rome*, book 21, chapter 21.
[7] Caesar, *De bello Gallico*, book 5, chapter 35.

back to the 5th century BC[8] or the image of a slinger on the reverse side of a silver stater of Aspendos in Pamphylia, dated from the 4th or 3rd century BC[9].

Although sources do not reveal the use of this tool in the battles of the Ligurians, it is however the archaeological finds that indicate its massive use in Ligurian contexts. Nevertheless, it is more difficult to understand whether sling projectiles were used by the Romans or the Ligurians. Discoveries of acorn missiles come from different settlement contexts of the Apuan Alps[10].

COMPOSITION AND DIVISION OF SLINGS

Basic sling parts include finger loop, cord, pouch for inserting projectiles and a cord for releasing projectiles. Most slings consist of equal lengths of cord on either side of a wider section called a pouch or a cradle[11]. The pouch is designed to hold the projectile, usually a stone, and it is the focal point of a sling. Its function is to hold the projectile securely until it is released and sent to its target. A finger or a wrist loop is often worked into the end of one or both sling cords to keep the sling in the hand once the projectile is thrown (**Fig. 1**)[12]. According to the material they are made of, slings can be divided into those made of leather, natural rope and those made of mixed materials (e.g., pouch is made of leather, while cords are made of natural or artificial materials).

Slings made of leather can be made out of a single piece, of three parts put together or out of braided leather strings. Leather represents an excellent material for sling production: it is elastic and rather resistant. Thicker leather pieces are used as cords, since they are flexible and thus possess the best features when elasticity and torsion are needed. On the other hand, fine thinner pieces are used for pouches, since they give the best flexibility and attach to projectiles in the best possible way. The image (**Fig. 2**) depicts one of the most commonly made leather slings consisting of three parts. While making such slings, one needs to pay extra attention to connecting separate parts, since junctions should not disrupt launching of projectiles. This type of sling was used by the Romans for launching larger stone pieces, e.g., during sieges of different fortifications, when precision was not of very high importance. Slingers with this type of sling were positioned within the ranks of closed military formations. One of the images depicting Roman slingers is shown on Trajan's Column (scene 66, 167-168) (**Fig. 3**).

Slings made of natural fibers can be made out of a single piece or several of them. Fibers used for braiding slings can be of semi-circular or

[8] Paunov, Dimitrov 2000, p. 46, Fig. 1.
[9] Paunov, Dimitrov 2000, p. 47, Fig. 2.
[10] Guareschi 2016.
[11] Owen, Newhouse Flynn 2017, p. 11.
[12] Owen, Newhouse Flynn 2017, p. 133.

circular cross-section or they can be flat. They represent the longest and most frequently used slings throughout history. Their performance is excellent, but in order to obtain the best examples, one needs to be an exquisitely skilled slinger, well acquainted with braiding and knitting techniques. Just like the former type made of leather, they are intended for launching larger projectiles, mostly large pieces of stone. Although there is a large spectrum of natural fibers, the most commonly used ones are hemp and esparto grass. The simplest way of braiding includes thin ropes braided to form both cords and pouches. The ropes are made of fully natural, unprocessed fibers (**Fig. 4 a and b**).

In modern times, making slings out of mixed materials is the most practical and quickest way to do it (**Fig. 5**). Cords are usually made of soft materials, like cotton or polypropylene, while pouches are usually made out of leather pieces. As said before, one should pay special attention to connecting different sling parts. These slings are suitable for all kinds of projectiles and are most frequently used by experimental slingers.

Pouches also come in various shapes. Leather pouches consist of a single piece, usually rectangular, rhombic or circular. Rectangular or rhombic pouches are suitable for launching larger projectiles, like larger stone pieces, while the circular ones fit best for smaller projectiles like those made of lead. To hold projectiles more securely, perforated pouches are used. Being rounded, such pouches fit projectiles better (**Fig. 6**). Split pouches are cut in the middle and they show an effect similar to the perforated ones. On the other hand, they are most similar to the pouches made of natural fibers. Fiber braided pouches can possess a single opening or can be split into two, four or more openings (**Fig. 7**). While braiding, one should pay attention to avoiding knots, especially in the junction area of cords and pouches. All of the processes described above are part of the paper about making slings by one of the authors[13].

PROJECTILES

Materials most commonly used for projectiles are stone, clay and lead. Ever since Mesolithic times, over the Metal Ages, Antiquity and later on, there has been a tendency to standardize the size and weight of projectiles as much as possible. In such a way, high launching speed was achieved and great precision in hitting targets, which was of great importance especially during military campaigns. On the other hand, standardizing projectile size and weight required a quick and efficient projectile production for which a larger number of molds was used, like those for lead projectiles[14]. For usage of slings outside the

[13] Илић 2023.
[14] Owen, Newhouse Flynn 2017, p. 11-12.

battlefield, for example on ranches or during hunting, projectiles of natural origin were used, like pebbles.

Stone projectiles, namely pebbles, are among the most commonly used[15] (**Fig. 8**). The best results are achieved with pebbles from flowing watercourses that can be found along shores. Permanently shaped by water and waves, they obtain perfect regular oval or circular shapes. Stones discovered at the site of Danebury in Hampshire (UK) represent a good example[16], but also those from the Scottish hillfort Burnswark[17]. The find of about 3600 stone missiles originates from the Celtic oppidum in Nages, France[18]. A detailed study of stone sling missiles is given by Kubíková[19]. While choosing, one should pay attention to the stones not possessing flattened edges, since such pieces are less aerodynamic and their range is shorter. Further on, such edges can cause an unexpected change of direction. The choice of projectile's size and weight depends on whether the emphasis is on range or impact. Most commonly, pebbles are used weighing between 50 and 250 g, which corresponds with their diameter between 4 and 7 cm. An average pebble used as projectile weighs around 150 g and has a diameter of about 5.5 cm.

Clay or mortar projectiles[20] (**Fig. 9**) are the first ones to be made in series and they have been made ever since the Neolithic. Clay projectiles fired in kilns possess extraordinary hardness although those dried in the sun are also rather hard. Needless to say, producing projectiles dried in the sun is more economical and faster. Besides, projectiles made in such a way contain a certain amount of water and elasticity, which would otherwise be lost during firing. In order to achieve a better clay projectile structure, they have often been mixed with sand, making some kind of mortar that offered higher resistance. Fortunately, in natural mud there is often a certain admixture of sand and this mixture is therefore not difficult to achieve. If the amount of sand is insufficient, a projectile would burst at the moment of impact, but it may even crack during drying in the sun. If the amount of sand is too high, it would crumble. Kubíková also provides a detailed study of clay sling missiles[21]. It is interesting to mention that during Roman times, some clay projectiles were inscribed with names of the people who made them[22] or with curses and the like[23]. Projectiles made of

[15] Sovernigo 2018, p. 99; Stiebel 2013, p. 299, Fig. 14.2 and 14.4.
[16] Wieselberger 2019, p. 44.
[17] Reid 2016.
[18] Wieselberger 2019, Fig. 32.
[19] Kubíková 2015, p. 124-126.
[20] Sovernigo 2018, p. 99.
[21] Kubíková 2015, p. 127-130.
[22] Buonopane 2014.
[23] Owen, Newhouse Flynn 2017, p. 12; Casella 2019, p. 699, Fig. 1 and p. 700, Fig. 2; Laflı, Buora 2021, p. 163; Tsaravopoulos 2012; Stiebel 1997, p. 304, Fig. 3; Nankov 2015.

cement show similar features, but they are more resistant even if they are not heavier. Some clay projectiles are made with perforations, with the intention of producing a hissing sound while flying. They were used as weapons for psychological warfare or for signaling[24].

Lead projectiles (**Fig. 10**) were used for the first time in ancient Greece[25]. Their main positive features are small size and low weight. This means that these projectiles undergo little air resistance and this is also why they are rather precise. A lead projectile that weighs 20 g possesses quite a big impact power, while a stone projectile of the same weight would suffer from great deviations in its trajectory, which would again reduce its impact power. Lead projectiles used in different historical periods possess an average weight of 50 g, contrary to stone projectiles that usually weigh between 250 and 300 g. The most important new feature of the lead projectiles is the penetration effect. A typology of lead sling projectiles is given by Arnaud, Boisse and Gautier[26]. Sovernigo explains that they were used by the Roman infantry and that the best among them originated either from the Balearic Islands or the isle of Rhodes[27]. Greep reveals further data about Roman sling bullets discovered in Britain[28]. Lead projectiles were also mass-produced[29].

Aiming to study the sling as a weapon in ancient Thrace, a great number of sling artifacts were documented and presented by Nankov[30]. In his monograph, he included all the artifacts from the territory of present-day Bulgaria. The majority of those finds represent projectiles of various materials, sizes and shapes, some of them with inscriptions or with deformations caused by impact[31]. It also includes the efficiency of sling projectiles and the damage they cause to various materials[32].

There are more sling projectiles that are still unpublished, found in a couple of archaeological sites in the area of the town of Svrljig[33]. Six sling bullets were discovered at the sites Svrljig grad (3), Church of St. Ilija in Niševac (2) and Gradac in Labukovo (1). They are all made of lead and their

[24] Илић 2023, p. 117-118.
[25] Xenophon, Anabasis, book 3, chapter 4.
[26] Arnaud *et alii* 1999.
[27] Sovernigo 2018, p. 97.
[28] Greep 1987.
[29] Sovernigo 2018, p. 97-99; Stiebel 1997, p. 303, Fig. 2.
[30] Nankov 2023.
[31] Nankov 2023, p. 157-196, Plate I-XL.
[32] Nankov 2023, p. 108, Fig. 10.
[33] I wish to express my gratitude to custodians of the Hometown Museum Collection of the Cultural Center Prof Sreten Petrović Iče in Svrljig for sharing the information about the finds. Special gratitude to A. Tasić, MA.

length varies from 3 to 4.5 cm. One of them has a circular perforation in the middle.

In 2010, an experiment was conducted, aiming to measure trajectories and range of clay and lead projectiles of the same shape and weight. The results showed that, under the same conditions given, lead projectiles fly further than the clay ones[34]. Surprisingly, although they fly further, the impact of lead projectiles is also bigger than that of the clay ones, especially of those possessing biconical shape[35].

SLINGING TECHNIQUE

The throwing techniques control the initial velocity at departure of the missile from the sling (departure velocity) and the angle of departure. Departure velocity is determined by the length of the path over which acceleration occurs, the uniformity of acceleration along that path, and the acceleration itself. The angle of departure is unaffected by departure velocity[36].

The slinger's position during shooting is as follows[37]: the slinger faces either left or right, he is slightly leaning forward and his head is turned towards the target. His legs are also slightly leaning forward. The slinging is initiated with a single movement, from the back, then in front of or above his head. While launching the projectile, the entire body is rotating towards the launching direction. Regarding rotation of the sling before launching the projectile, it can be vertical, horizontal or angled (**Fig. 11**)[38].

With vertical rotation[39], the sling and its projectile are always in the same plane as the target. Most of the rotation is performed with the entire arm, from the shoulder to the hand. Rotation speed depends on projectile's weight: the lighter the projectile, the greater the rotation speed needed and vice versa. A projectile launched in this manner has the greatest impact power at the point when its upward trajectory turns downward. No distinction was made between long distance and close quarters, since the authors never practiced vertical rotation exclusively, at the same time using the same type of projectiles.

With horizontal rotation[40], the greatest part is performed by rotating wrists. Rotation is initiated next to the body and lifted above one's head with a quick movement. As with the previous technique, the greatest impact power is at

[34] Skov 2013, p. 74, Fig. 12 and p. 75, Table 10; Marugán 2017, p. 119, Fig. 6.
[35] Skov 2013, p. 85, Table 13.
[36] Dohrenwend 2002, p. 33.
[37] An image representing a Greek slinger in this position is known from a Greek amphora discovered in Nola, dated to the 5th century BC (Daremberg, Saglio 1896). Another image is depicted on Trajan's Column, scene 66.
[38] Dohrenwend 2002, p. 34-35.
[39] Dohrenwend 2002, p. 34; Salva 2013, p. 22, Lamina III.
[40] Dohrenwend 2002, p. 34; Salva 2013, p. 23, Lamina IV.

the beginning of its downward trajectory. Angled rotation also includes most of the rotation performed with wrists. The greatest impact power of a projectile launched in such a way is at its upward trajectory. Beginning with the sling pouch containing the projectile on the ground in front of the slinger, the sling is whipped backwards and up behind the slinger to describe a complex, curved, vertical path that arcs upwards. As it descends, the sling is given a straight, sidearm acceleration toward the target. This technique is somewhat similar to cracking a whip, and imparts a greater acceleration to the projectile than the two techniques described above, and gives the greatest height and distance[41]. Several other techniques are also applied, but they basically represent variations of the three techniques named above[42].

Figure 12 shows several ways of holding the sling: the common one, the Italian one and the mixed one[43]. Among them, the Italian grip is the most precise, followed by the mixed grip, since it allows the best control of projectile's direction at the releasing point. Basically, the direction is controlled by finger pressure upon the cord. **Figure 13** shows the so-called Greek initial position, undoubtedly showing horizontal sling rotation[44]. This way of slinging was applied by the Greek, Balearic and Roman slingers. This way of projectile launching enables an unobstructed view of the target. However, there is a possibility to take this position in reverse and shoot straight, but only if the shooter is going for a short range, like in the cases of taking one last shot before running away and leaving the position. The following images show how slings are held at the ready, i.e., in expectation (**Fig. 14 a and b**), during hunting (**Fig. 15**) and on the march (**Fig. 16**)[45]. Each slinger carried several slings of different lengths. There is an opinion that during marches, slingers kept their slings tied around their heads.

Within Roman military troops there were often slingers – either soldiers who had slings as their only (primary) weapon or those who carried slings as additional weapons[46]. Soldiers who used slings as their primary weapon usually served in auxiliary units. The best slingers were considered to come from the Balearic Islands in modern Spain. It was believed that they were trained from the youngest age to use slings. According to tradition, Balearic mothers did not give their children food until they had hit the bowls with their meals in them. Skilled slingers were believed to be able to hit targets at distances of up to 300 m. The presence of slingers within troops stationed along the northern Roman limes in

[41] Dohrenwend 2002, p. 35; Salva 2013, p. 24, Lamina V.
[42] Savage 2011.
[43] Salva 2013, p. 19, Lamina I.
[44] Salva 2013, p. 20, Lamina II-1.
[45] Salva 2013, p. 21, Lamina II-2.
[46] Diodorus Siculus, book 5; Trajan's Column, scene 66.

Serbia is confirmed by the hoard find of ceramic sling bullets from *Novae*, the present-day Čezava[47]. Those finds are kept as part of the Roman collection at the National Museum of Serbia in Belgrade[48]. The sling bullets are similar in appearance (shape) to the ones depicted in **Fig. 9**.

Although ancient sources often mention archers, javelin-bearers and slingers together, Xenophon[49] considered slinging to be much more efficient than the other two disciplines. Advantages of slings are that they are rather easy to make of simple materials and in a short period of time. Besides, even without proper projectiles, one could use any kind of stone found nearby. Wounds caused by a sling hit can be compared to those made by gunshots[50].

Apart from being a weapon, slings were also used for many other purposes. Actually, it is believed that they were initially used for hunting or herd and field protection. They were used for signaling, when smaller harmless projectiles would be launched as a sign or a warning towards fellow fighters. Finds of pierced lead projectiles, for example from the Burnswark fort (Great Britain),[51] indicate that the Romans were well acquainted with the frightening effect. Pierced projectiles actually produce an irritating hissing sound and cause disruption among enemy ranks.

CONCLUSIONS

Although slings have the longest history and the widest use of all weapons, the greatest knowledge about shapes and usage of slings is connected to Roman times. In ancient times, the materials slings were made of were of natural origin, either plant-based or leather. The same goes for materials used for projectiles, which most commonly include pebbles (stones) or hand-made clay projectiles. Such ammunition was mass-produced for the needs of military campaigns. The most frequently applied shooting techniques are vertical, horizontal and angled rotation. Vertical rotation is applied when the target is in the same plane with the shooter.

Even today, slings are made very easily and as a testing and training weapon, they offer many advantages over the bow and arrow or darts[52]. These latter systems are comparatively expensive to construct, requiring many hours of labor, while a sling may be manufactured in a couple of hours if materials are

[47] Вујовић 2007.
[48] Вујовић 2007, p. 297.
[49] *Anabasis*, book 3, chapter 4.
[50] Borrini *et alii* 2012, p. 35; Robertson 2016, p. 29.
[51] Reid 2016, p. 25.
[52] Илић 2023, p. 115-116.

available[53]. Lost sling projectiles, most often simply being an unmodified pebble, are much less of an issue than lost darts or arrows[54].

Owing to low-cost production and accessibility of the material needed, slings also make an excellent experimenting subject[55]. A number of experiments were conducted regarding slings and some of their aspects. Besides the already mentioned one by Skov[56], an interesting one was conducted by Jackson in 2019[57]. He conducted a total of three experiments: the first one regarded the time necessary for an unskilled person to make a leather sling, which was about five and a half hours. In the second experiment, Jackson wanted to measure how far he could throw a ball by hand and then compare his results to how far he could throw a ball via the sling. For this experiment, he used three separate balls, a golf ball weighing 44 g to replicate the common sling-stone, a hockey ball weighing 150 g to replicate a large sling-stone, and a 308 g ball to replicate a ballista-ball. The distances gained with sling shots were doubled or even tripled compared to those thrown by hand[58]. Finally, in the third experiment, Jackson observed accuracy over distance, reaching the expected conclusion that the closer the target, the higher accuracy. Another experiment regarding shot distance was published by Brown Vega and Craig[59].

This being said, slings are a rather suitable weapon to be presented at various festivals and re-enactment events. On such occasions, visitors can be taught how to use slings, but also how to make them and how to make projectiles[60]. Frequent sling making and testing would further lead to applying knowledge of sling technology to archaeological problems and to further exploring the technology itself.

Both of the authors took part in various festivals and re-enactment events, like in 2021, within the Erasmus+ project entitled "Danube camps – The 2nd International Danube Camp"[61], when one of the authors organized a slinging and sling-braiding workshop at Viminacium. At that camp[62], teenagers learned how to shoot with slings and also how to braid them[63]. In the same year, a similar presentation was held in Ptuj (Poetovio), during the festival within the Erasmus+ project entitled "Sadike za prihodnost" – "XIV Roman Games in

[53] Özdoğan 2002, p. 443.
[54] Skov 2013, p. 108.
[55] Robertson 2016, p. 39-76.
[56] Skov 2013.
[57] Jackson 2019.
[58] Jackson 2019, Fig. 3 and 4.
[59] Brown Vega, Craig 2009.
[60] Anđelković Grašar *et alii* 2021, p. 139-140.
[61] https://www.calameo.com/read/006806684aa0553c1bc80 (accessed September 2023).
[62] Илић 2023.
[63] https://www.calameo.com/books/006806684aa0553c1bc80 (accessed May 2023).

Ptuj"[64]. Both presentations and demonstrations about the slings are based on the personal interest and long-term usage of slings by the authors[65].

Ever since their first appearance at the Kainua festival in 2014 (Marzabotto, Italy), the organization "Popolo di Brig" presented the process of making slings and bullets, every time they did an event as Ligures Veleiates. This is one of their educational activities in Italy and abroad.

To this day, slings are used in everyday life in some areas of the world, for example for chasing away pests on farms. One also witnesses their dangerous use during different types of civilian protests. Slings and their usage are a rather interesting topic and also a subject of academic discussion[66].

LA FROMBOLA ANTICA

RIASSUNTO

Nel corso dei secoli, le fionde sono state fra le armi più antiche e più utilizzate. Venivano utilizzate sia per la caccia che per la guerra, ma anche per altri scopi. La maggior parte delle informazioni scritte relative alle fionde ci è stata tramandata da autori greci e romani.

Le parti fondamentali della fionda sono l'anello per le dita, la corda, l'astuccio per inserire i proiettili e la corda per rilasciarli. I materiali più comunemente utilizzati per la loro fabbricazione sono corde di origine vegetale o il cuoio. Per quanto riguarda le munizioni utilizzate, le più comuni risultavano essere semplici sassi, ma le evidenze storiche testimoniano anche quelle in argilla e piombo. I proiettili di argilla o piombo erano prodotti principalmente a supporto delle campagne militari.

La tecnica di tiro con la fionda prevede la rotazione dell'intero braccio, dalla spalla alla mano. La velocità di rotazione dipende dal peso del proiettile e può essere eseguita in diversi modi: in verticale, in orizzontale e ad angolo. La tecnica di tiro comprende anche diversi modi di tenere la fionda in mano.

Il principale vantaggio delle fionde è che si realizzano molto facilmente e rappresentano un'arma molto pratica. Una fionda può essere fabbricata in un paio d'ore, se i materiali sono disponibili. Inoltre, le fionde sono adatte a essere presentate in vari festival ed eventi di rievocazione storica o archeologia sperimentale. In queste occasioni, si può insegnare ai visitatori come usare le fionde, come costruirle e come realizzare i proiettili.

[64] Anđelković Grašar *et alii* 2021, p. 139-140, http://viminacium.org.rs/wp-content/uploads/2021/09/Roman-games-in-Ptuj-2021-NL-final.pdf (accessed September 2023).
[65] Илић 2023.
[66] Ma 2010.

ABSTRACT

Over all periods of the past, slings were the weapons with the longest history and most widespread use. Still, the greatest knowledge about shapes and usage of slings is connected to Roman times. They were used for both hunting and warfare, but also for signaling and scaring the enemy.

Basic sling parts include finger loop, cord, pouch for inserting projectiles and a cord for releasing projectiles. Materials most commonly used for making slings are rope of plant origin or leather. Combining materials is also possible, when the loop and the cords are made of rope and the pouch is made of leather. Regarding ammunition, stones were most frequently used, but also projectiles made of clay or lead. Projectiles made of clay or lead were mass-produced for the needs of military campaigns.

Finally, the sling shooting technique includes rotation of the entire arm, from shoulder to hand. Rotation speed depends on the projectile weight. Rotation can also be performed in several ways: vertically, horizontally and angled. Vertical rotation is applied when the target is in the same plane with the shooter, while the horizontal one is used for example for shooting from a rampart. The shooting technique also includes several different ways of holding the sling in one's hand.

The data presented here partially originate from the research and demonstrations by the re-enactment group "Popolo di Brig" from Italy, but partially also from personal interest and practical knowledge about this type of weapon.

АНТИЧКА ПРАЋКА

РЕЗИМЕ

Током векова, праћке су представљале најстарије и најчешће коришћено оружје / оруђе. Употребљаване су како за лов, тако и за ратовање, али и за друге намене. Највећи број писаних података о праћкама потиче од античких грчких и римских аутора.

Основни делови праћке обухватају петљу за провлачење прста, траку, торбицу за уметање пројектила и траку за испуштање, односно лансирање пројектила. Материјали који се најчешће користе за израду праћки су конопци израђени од биљних влакана или од коже. Што се тиче најчешће употребљаване муниције, она обухвата једноставне облутке, али и пројектиле израђене од глине или олова. Глинени и оловни пројектили су коришћени у војним кампањама.

Техника ротирања праћке обухвата кружне покрете који се изводе целом руком, од рамена до шаке. Брзина ротације зависи од тежине пројектила, а може да зависи и од начина самог ротирања, које може бити вертикално, хоризонтално и под углом. Техника ротације зависи и од самог начина држања праћке у руци.

Највећа предност праћке јесте да се једноставно израђује и да представља изузетно практично оружје / оруђе. Ако је на располагању потребан материјал, праћка се може израдити за пар сати. Такође, праћка је погодна за презентације у

склопу разних манифестација које укључују (пра)историјску тематику или пак, експерименталну археологију. Током оваквих манифестација, посетиоци могу да уче како да користе праћку, како да је направе или како да израде пројектиле.

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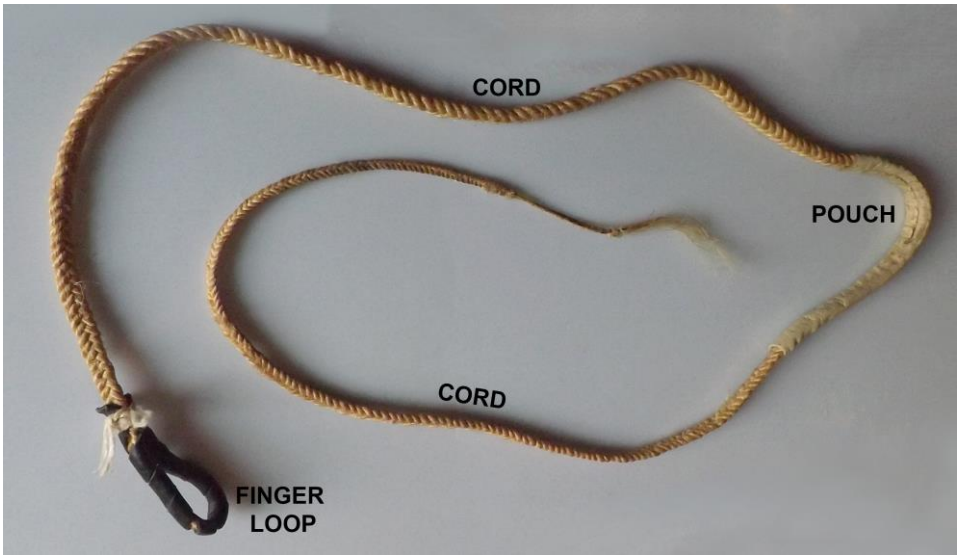

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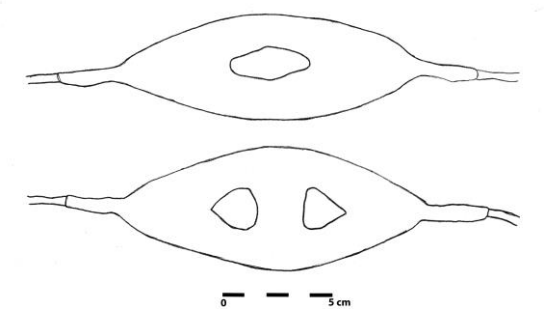
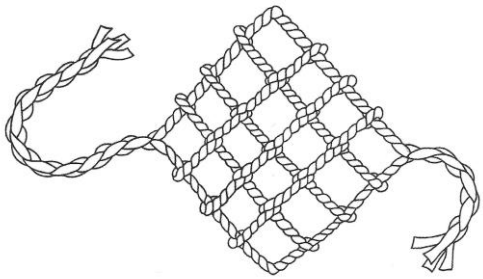


Fig. 6. Examples of perforated pouches (drawing by I. Ilić).



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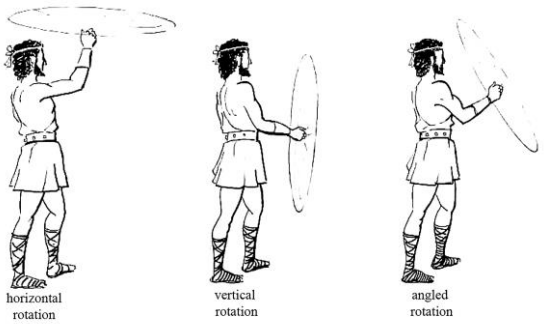


Fig. 11. Sling rotation (after Salva 2013, p. 21, Lamina III, IV and V).

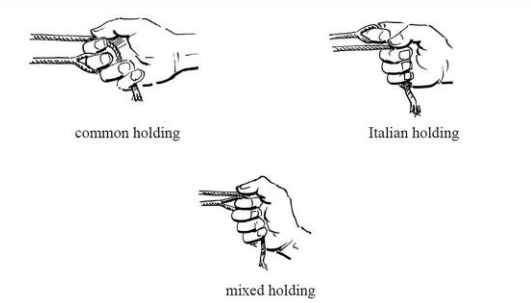


Fig. 12. Sling holding (after Salva 2013, p. 19, Lamina I).

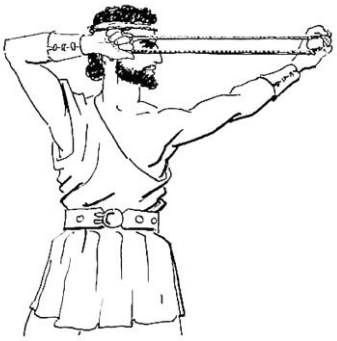
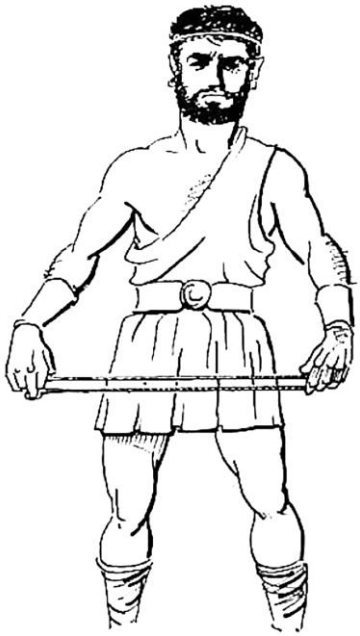


Fig. 13. Greek initial slinging position (after Salva 2013, p. 19, Lamina II-1).



a



b

Fig. 14a-b. Sling holding at the ready (after Salva 2013, p. 21, Lamina II-2).



Fig. 15. Sling holding during hunting (after Salva 2013, p. 21, Lamina II-2).



Fig. 16. Sling holding during march (after Salva 2013, p. 21, Lamina II-2).